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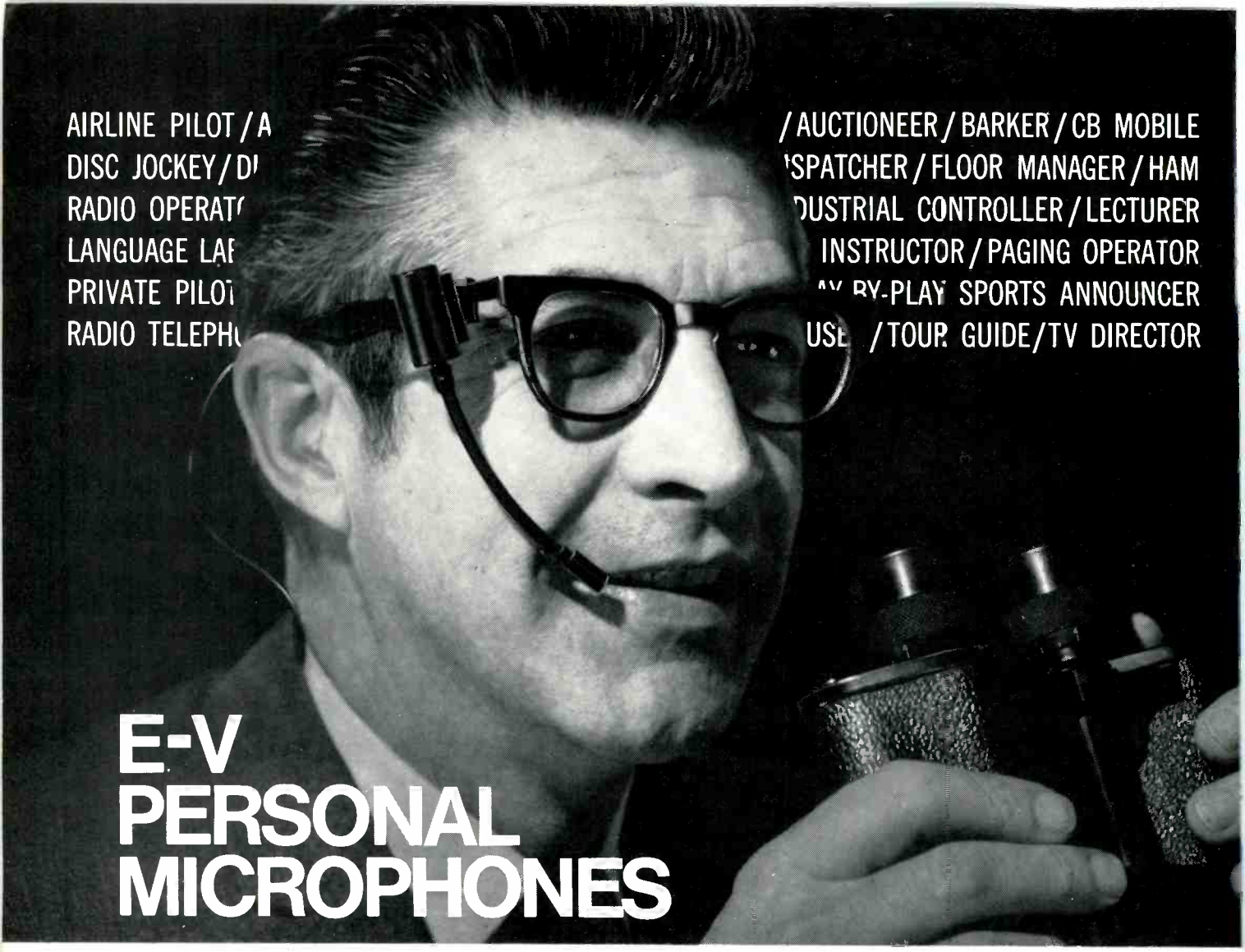
Broadcast Engineering®

the technical journal of the broadcast-communications industry

A HOWARD W. SAMS PUBLICATION

NAB convention roundup page 42

National Radio Month
Audio Installation
TV Election Reporting



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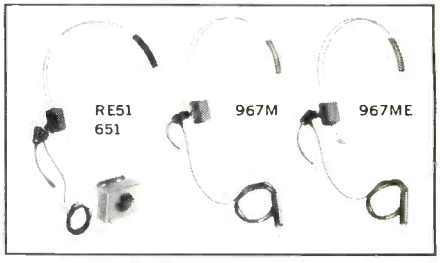

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May, 1971 • Volume 13, No. 5

Broadcast Engineering

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

Our cover this month shows the towers and transmitting antennas atop the John Hancock Building in Chicago, the 1971 NAB convention city. For coverage of the NAB convention, see page 20. (Photo courtesy of RCA.)

DEPARTMENTS

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Robert E. Hertel, Publisher

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DIRECT CURRENT FROM D. C.

May, 1971

By Howard T. Head

VHF TV Remote Control Authorized

As predicted (March, 1971 Pompous Predictions), the Commission has authorized the remote control of VHF TV transmitters. At the same time, new rules were adopted imposing stricter remote control requirements for all TV transmitters, UHF as well as VHF. Existing licensees have one year within which to meet the tightened requirements.

In adopting the new rules, the Commission abandoned an earlier proposal which would have required a six-month "shakedown" with an operator on duty at the transmitter. Also, a one-hour "grace period" is instituted, during which loss of telemetry is permitted without requiring automatic or manual shutdown of the remotely-controlled transmitter.

One of the principal features of the new remote control regulations is a requirement for substantial improvement in monitoring of the off-the-air TV signal at the remote control point. The exact form of the monitoring is not specified, but the Commission has called for comments, including a possible requirement for a locally-inserted VIT signal. Such a requirement might involve complications with the increasing number of reports of an aural "buzz" in some receivers when a VIT signal is being transmitted (See April, 1971 D.C.). Until the monitoring requirements are settled, the Commission does not intend to issue any actual remote control authorizations.

The new rules require regular inspections of remotely-controlled TV transmitting plants. Daily inspection is required five days a week, with exceptions for installations with standby transmitting facilities having a power output of at least 20 percent of that of the main transmitter, where inspection is required once a week only.

Inquiry Set On Interference to Television Reception

Also as predicted (March, 1971 Pompous Predictions), the Commission has issued a Notice of Inquiry looking into possible measures to reduce the growing problem of interference to TV reception from FM. In doing so, the Commission broadened the scope of the originally-intended inquiry to include interference to television reception from all sources (not just FM transmitters), including television reception by cable as well as off-the-air.

Among the matters covered by the Commission's Notice are possible improvements in TV receivers, including coaxial RF inputs, the establishment of a "blanket contour" for FM transmitting installations, and the possibility of requiring the co-location of FM and TV transmitters serving the same city.

(Continued on page 6)

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(Continued from page 4)

The Commission has also informed the Senate Commerce Committee of a June 1971 target date for the adoption of new rules governing the allocation of non-commercial educational FM broadcast channels (88-92 MHz) immediately above TV Channel 6 (82-88 MHz). International agreements with Canada and Mexico are required before such rules can be daopted, and negotiations have been under way for some time.

In the meantime, the Corporation for Public Broadcasting (CPB) has undertaken its own studies of the matter. CPB has written to all receiver manufacturers asking for performance data of color TV receivers in the presence of both upper and lower adjacent-channel interference (VHF only).

Frequency Allocations To Be Proposed for Satellite-to-Home TV Broadcasting

The Communications Satellite Corporation (COMSAT) has proposed to the Commission and to the Department of State that frequencies near 12 GHz be allocated for direct satellite-to-home TV broadcasting. These allocations will be discussed at the Sixth World Administrative Conference (WARC) beginning in Geneva in June 1971. The 11.7-12.2 GHz band would be allocated for this purpose on a secondary basis.

Earlier proposals for frequency allocations for this service had included regular use of the UHF broadcast band above Ch. 37 (614 MHz). However, the U.S. feels that such usage would conflict in this country with domestic UHF TV broadcasting; abroad, foreign administrations are reluctant to provide for assignments which might find a ready audience for foreign reception.

The 12 GHz assignments are to be proposed notwithstanding impressive evidence that the rainfall attenuation in the band will make diversity reception a virtual necessity. Experimentation in this country by Bell Telephone Laboratories (BTL) have shown that characteristics of rainfall cannot be ignored even from reception in space. Experimentation with terrestrial broadcasting in the band is taking place in Germany using wideband FM transmission.

Emphasis on Engineering on Decline at FCC

We noted in passing in our March, 1971 Pompous Predictions that emphasis on engineering matters at the Commission is fading as the Commission becomes increasingly occupied with non-engineering matters. Recent months have seen the FCC involved in such non-engineering matters as station ownership, the fairness doctrine, song lyrics, and even the question of whether bull fighting constitutes cruelty to animals.

A 1952 amendment to the Communications Act provides for an engineering assistant for each Commissioner, although on an optional rather than a mandatory basis. At one time all seven Commissioners relied on engineering assistants, but with the de-emphasis on engineering matters an increasing number of Commissioners have dispensed with their engineering assistants, culminating with the re-assignment of C. Phyll Horne, Engineering Assistant to the Chairman, to the Frequency Allocations and Treaty Division.

The de-emphasis on engineering comes at a time when rapidly expanding technology confronts the Commission with many challenging engineering problems. The Commissioners have not included an engineer among their ranks since the retirement of T.A.M. Craven as Commissioner in 1963.

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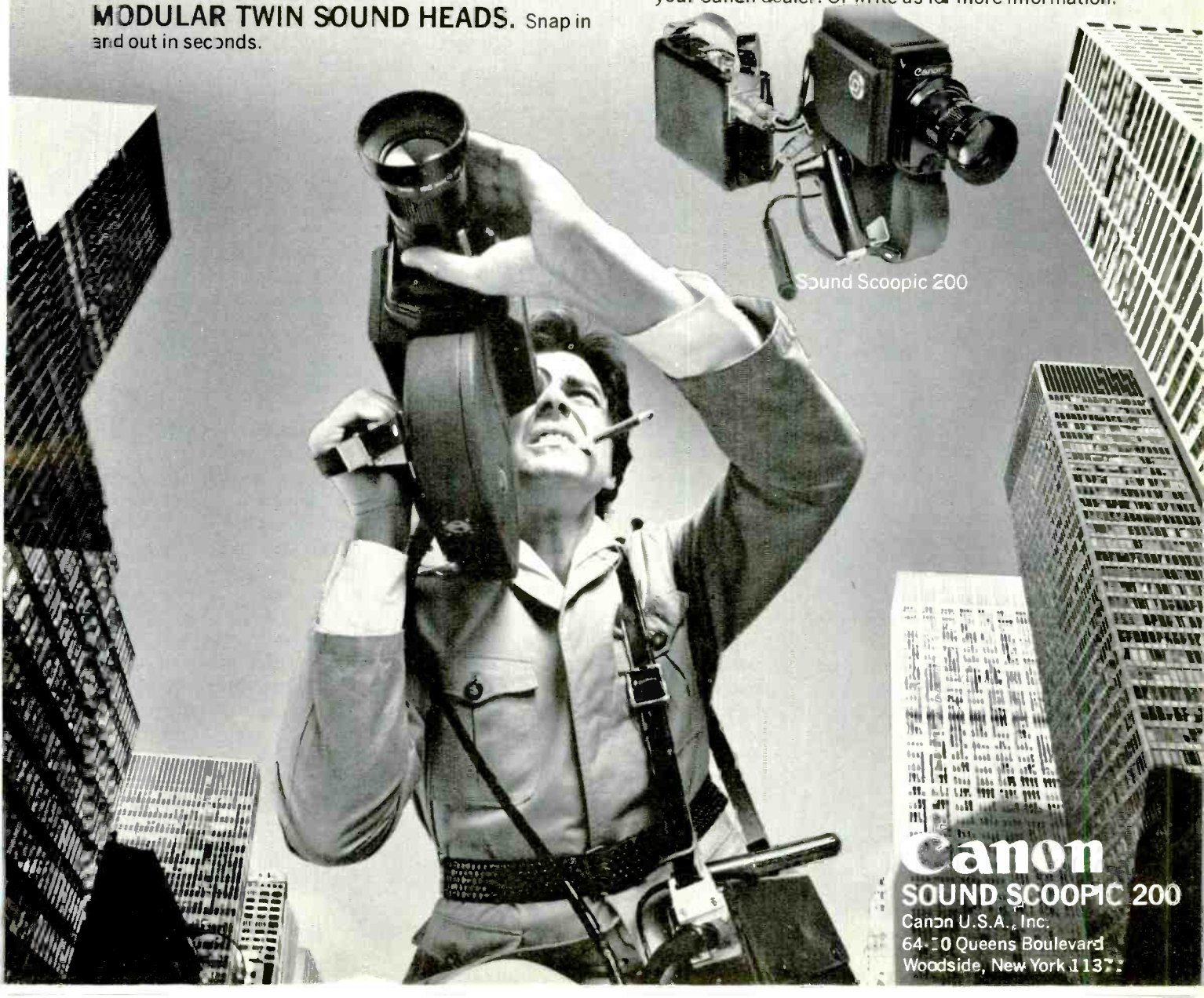

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LETTERS TO THE EDITOR

What's In The Gap

Dear Editor:

I have read with a great deal of interest your recent series of articles, "Closing the Management Engineering Gap". I would like to share some of my views with your readers.

First off I respect the views and experience of those older than myself in the industry and I don't profess to be a know-it-all. I feel that I'm typical in many respects of the average engineer in this industry. I'm a married family man whose life is Broadcasting. My great aspiration is owning my own radio station. My job isn't 9 to 5, but extends into my hobbies of Ham Radio, Audiophile, and FM/TV, DXing, etc. This is where I spend every spare cent.

I believe the First Class Radio Telephone license is a license to learn more instead of a demonstration of one's knowledge of Broadcast Engineering. Where a person stops is a matter of personal initiative. Ben Wolfe, NAB Engineer of the Year, is a classic example of what can be done by one individual.

The majority of Broadcast Engineers I have met and worked with are in it for one reason—they love the work. Sure they could make a lot more money in some other area of electronics, but their heart is with Broadcasting. For this reason I feel that the suggestion of fining the engineer in most cases is absurd, regarding technical violations. The majority of engineers I have met are industrious and hard working, those with an I don't care attitude are a minority.

The real problem lies in two different management philosophies. To illustrate lets call one Station A and the other Station B. Station A operates with a real sincere desire to serve the community with a quality product. They spend money on good technical personnel and equipment, they do research and development work and they believe this gives them an edge on competition, and it does. In addition they offer good wages, retirement plans, insurance plans and good working conditions. They replace equipment periodically to keep up with the latest technical advances, they provide adequate replacement parts to

Hats Off For Radio

National Radio Month 1971 certainly is a time for remembering. While there are memories that could be awakened here to recall its greatness, that really is not necessary. If you need to look for greatness, you need to jump beyond those early years.

The early years were filled with confusion and excitement, but they had not met any more competition than the "talkie" movies. Over the years, radio has continued to serve the public interest. It has, time after time, met the challenge of competition.

The formats are far removed from the early days. The equipment has changed and its people are a slightly different breed. And the facilities themselves had evolved into something reminiscent of the old days, yet mostly they reflect the contemporary scene. And not so mysteriously, they are all linked to millions of transistor car, clock and pocket radios.

But one thing never changes. When disasters and emergencies hit us, it is radio that comes through. Suddenly a mobile society stands still and listens. From the "bubble gum" stations to "all talk" stations, the public interest . . . in the time of greatest need . . . has never been forgotten.

So it is then, that in the race of the technological explosion and the bustle of our time, we pause momentarily to salute Radio.

keep this equipment functioning properly as well as using the best test equipment available, to keep their investment at top performance.

Station B is what I refer to as a carpet bag operation. The philosophy is to maximize profits and minimize quality. This station may or may not be showing a profit on the books. In fact, it could be run as a tax write-off; however, the manager lives lavishly with an expensive home, a big car, a fabulous expense account, plus numerous tradeouts which benefit him. The engineer here is either on call or works for a meager wage. He has to either beat the manager over the head or threaten to quit to get spare parts—and test equipment is lack- if not non-existent.

It is Station B which I believe the FCC should blow the whistle on and blow it hard—not at the engineer but the management. This is certainly the type of operation which degrades the industry and is not in the public interest. I realize with this statement there are stations which genuinely want to serve their communities but for some reason or other they are having a hard time financially and need technical assistance and know how. Here is where I feel the FCC needs to be more compassionate and provide technical assistance and know how rather than hard line rules.

Thomas F. Nornhold, Pres.
Christian Edu. Bcstgrs. Inc.
Jacksonville, Fla.

Stereo-SCA Views

Dear Editor:

A special thanks to Mr. Tonne for his article "Can Stereo-SCA Be Compatible". As the only stereo-SCA station in a four stereo station market, we have been on the receiving end of a lot of those "birdie" complaints. It became apparent to us some time ago that no matter what we did at our transmitter, most stereo receivers would develop some whistle, and some far more than others.

Some of the things we found in trying to solve the problems tie in directly with Mr. Tonne's article: (1) 67 KHz filters in stereo receivers vary considerably in effectiveness. (2) Many 67 KHz filters are badly mistuned, and retuning

(Continued on page 10)

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the filter to 67 kHz helped considerably. (3) We operate our SCA channel with 6 percent injection. This means the SCA receivers in use have to be of good quality and latest design.

Some of the older SCA receivers require up to 9 percent injection for full quieting, and does this bring on those birdies. (4) We proved to ourselves the benefits of limiting the band width and controlling the level of the audio applied to the SCA channel—100 to 5000 cycles at the most and not over 5 kHz deviation. (The manufacturer of the SCA generator already suggested it). (5) Dropping the injection of the 19 kHz pilot from 10 to 8 percent (still within stereo specifications) improved the birdie situation on some sets, but we immediately found out that many stereo sets are equipped with stereo beacons that go out when the pilot goes any lower than 9.8 percent injection. So we run 9.9 percent to keep those stereo beacons lit.

On the other side of the fence, we had to keep our SCA channel leasor happy, and here our greatest problem was keeping the 38 kHz suppressed carrier and its harmonics away down. Seems the 38 kHz second harmonic (76 kHz) would beat with the 67 kHz and give birdies on the SCA receiver. The addition of a new solid state stereo-generator that derives its 38 kHz by dividing down from a higher frequency, rather than multiplying up from 19 kHz solved this problem for us.

I just wish Mr. Tonne could tell us how to keep the stereo modulation levels up equivalent to a non-SCA station without breaking the regulations or cross-talking into the SCA channel.

George Roach, CE
Ottawa, Ontario
Canada

FM Interference

Dear Editor:

I believe Mr. Mayer (February, Letters to the Editor) may have a problem similar to one we just hashed out here at WRUF. The FCC office had been notified our 2nd harmonic of WRUF-FM was wiping out channel 12 audio reception at a housing project. Our measured 2nd harmonic at the CATV site was 1.5 microvolt, so further investigation brought to light the following:

The CATV system was receiving channels 2, 4, and 12 all from about 70 miles away. The CATV system had a solid state pre-amp (De-Snower) attached to the channel 4 antenna. We found the channel 4 pre-amp was being overloaded by our fundamental signal at 103.7 MHz and as a result generated a very strong 2nd harmonic within the CATV system. By installing a quarter wave stub directly at the antenna input to the pre-amp we attunated our fundamental signal some 25 dB and this cleared all traces of 2nd harmonic interference and overload. I believe if Mr. Mayer will look into the new color TV antenna system he will find some signal which is driving it into overload. Another thing to look into might be mixing action taking place in a rusty joint or power line connection.

E. A. Slimak, CE
Station WRUF
Univ. of Florida
Gainesville, Fla.

INDUSTRY NEWS

Fee Schedule Ruling Adopted

A ruling clarifying the new FCC fee schedule has been adopted by the Commission (Docket 18802). The Commission action made no large changes, but resolved inconsistencies in determining different kinds of fees and modified the basis for computing some fees. The present fee schedule was adopted July 1, 1970, and became effective August 1, 1970. Congress, in considering FCC budgets, had earlier urged the Commission to increase its fees to fully support all its activities.

The Commission said its present action was in response to a number of petitions for reconsideration, and requests for review and declaratory ruling.

In regard to urgings by the Senate Appropriations Committee and the National Association of Broadcasters to make sure that new fees would not be too heavy for small broadcast licensees, The Commission said that it is making a continuing review of all charges and will make changes if they are warranted. The minimum annual operating fee of $52 for AM and FM licensees is equivalent to the price of just two one-minute spot announcements per month, the Commission asserted, and the minimum annual fee of $144 for TV licensees is equal to the price of only one 30-second spot announcement per month.

Some petitioners raised questions about the different approaches used by the Common Carrier and Safety and Special Radio Services Bureaus in computing fees for mobile stations and multiple transmitters. The Commission stated that fees in both services should generally be computed on a "per unit" rather than a "per application" basis, and that it would make changes to obtain a uniform approach.

The Commission noted objections to the $50,000 flat fee for initial construction of satellite earth stations, and to the $100,000 fee for satellite construction and launch, and said it would modify the grant fees for earth stations and satellite constructions so as to base these fees generally on a percentage of construction costs as set forth in the application.

In general, the Commission clarified the CATV fee schedule without substantial changes. The Commission stated that a separate form (326-A) for computation of the CATV annual fee, with the accompanying fee payment, must be filed for each separate and distinct community or municipal entity (including discrete unicorporated areas) served by CATV facilities.

IEEE Forms Group For CATV Freq Study

The IEEE Cable Television Task Force has formed a subcommittee to prepare a technical report on recommended frequency plans to be used on cable television systems. The Subtask Force is chaired by Robert S. Powers, Office of Telecommunications, Department of Commerce, Washington, D.C.

This report will probably have several suggested plans to cover several types of systems. The differences would be in such inter- and intra-system parameters as the total number of channels, individual channel bandwidths, types of services, and whether the system is one-way or two-way.

It is expected that this report will be of interest to city administrations, cable television system owners and designers, and manufacturers of cable television hardware.

Inputs from interested organizations, groups, or individuals are welcome. Inquiries should be addressed to: Mr. Jack O'Neill, National Academy of Engineering, Joseph Henry Bldg., Room 222, 2101 Constitution Avenue, NW, Washington, D.C. 20418.

VHF Remotes Get Okay

Remote control operation by VHF TV broadcast stations will be permitted for the first time under rule amendments (Part 73) adopted by the FCC (Docket 18425). Although UHF TV stations have previously been permitted remote control operation, the Commission said because of certain new requirements these stations will be given one year in which to comply with the amended rules.

Under the new rules, calibration and transmitter inspections will be required at least 5 days each week, the Commission said, unless a licensee maintains transmitting equipment capable of operation with at least 20 percent of authorized power, and has arranged for automatic switching or manual switching from the remote control point, in case of main transmitter malfunctions. In such a case, it said weekly inspections will be permitted. The present rules for UHF remote control specify weekly inspections.

The rules also require off-the-air monitoring facilities which must include, as a minimum, a visual wave form monitor, a picture monitor (which, as a practical matter, must be fed an off-the air signal), a loud speaker, and an aural modulation monitor.

Where any portion of a station's transmissions are in color, a color monitor and a vectorscope or other instrument designed to depict the instantaneous phase and amplitude relationship of color components will be required, the Commission said.

The rules contemplate that each television station operating by remote control would transmit locally generated test signals in the vertical interval suitable for continuously monitoring the performance of the transmitter and other equipment. However, this requirement was suspended pending a determination, in a further proceeding, of the specifications of the test signals to be employed, and other related questions.

The rules permit the use of a single subcarrier for multiplexing the aural carrier for the transmission of telemetry signals from the TV transmitter to its remote control location.

The rule amendments stem from a Notice of Proposed Rule Making adopted January 15, 1969.

The rules became effective April 30, 1971.

One-To-A-Market Waiver In Arizona

Combined Communications Corporation (CCC) licensee of stations KBLU and KBLU-TV, Yuma, Arizona, has been granted a waiver by the Commission of its recently modified "one-to-a-market" multiple ownership rules to permit common ownership and control of the two stations. Sections 73.35(a) and 73.636(a)(1) of the rules were waived to make the grant.

A previous requirement that CCC's acquisition of the stations must be conditioned on the outcome of FCC multiple ownership rule making proceedings has been removed. When the Commission approved CCC's acquisition of KBLU-TV on October 22, 1969, it said that it was conditioning its approval on the results of the multiple ownership proceedings because CCC already owned and controlled KBLU, a fulltime AM station in Yuma.

In an order released March 2, 1971, the Commission amended its one-to-a-market rules to apply only to VHF-AM-FM combinations. KBLU is a one kilowatt, fulltime station operating on 560 kilocycles and KBLU-TV is a VHF station operating on Channel 13.

Yuma, population 23,974, is in southwest Arizona, 55 miles from El Centro, California and Yuma-El Centro is classified as a single television market. Yuma is served by KBLU-TV and KECC-TV, El Centro.

In support of its waiver request, CCC argued that the Yuma-El Centro television market is small; that there is significant CATV penetration of the market, 35 percent of the TV homes; that both

KBLU and KBLU-TV have incurred significant operating losses; that the present co-ownership of the stations permits substantial cost reduction through use of a shared staff, and that separate operations would require $65,000 in additional personnel costs; that CCC has promoted diversity of broadcast media in its market by donating AM station KAWC to Arizona Western College; and that there is an abundant availability of competing broadcast and CATV service in this market.

In granting this waiver, the Commission emphasized that its approval rested on several exceptional factors including the fact that the Yuma-El Centro market is one of the smallest in the nation (ranked 205th under ARB rankings), and there is significant CATV penetration of the market. It said its action should not be considered as detracting from policies on co-ownership of aural and television facilities in the same market, recently specified in Docket 18110 (Memorandum Opinion and Order, Docket 18110, FCC 71-211, released March 2, 1971).

New Schafer Owner

J. M. (Jim) Cunningham has purchased the stock of Schafer Electronics from Applied Magnetics Corporation.

Cunningham, a vice president and director of AMC, has been with the firm since 1961, and headed their Systems and Computer Memories Divisions. Schafer Electronics, a supplier of broadcast automation systems, was acquired by AMC in 1968, and Jim has been serving as general manager for the last six months.

"YOU MEAN I HAVE TO HAVE PERMISSION TO MOVE ?"

On Closed Circuit Bout

Fight Sparks NAB-NCTA

The following is an exposure to modern day sophistication of fidelity communications. They amount to a statement by the NAB slamming closed circuit TV, and a rebuttle statement in which you'll find some real irony in word choice and strategy.

So the record will be straight, we stand back now and let the uncut battle rage.

NAB Statement

The National Association of Broadcasters has teed off on cable-pay television interests promoting the Frazier-Clay fight tonight in New York.

"This fight, blacked out on free television and radio in America and around the world, is a shocking example of what cable-pay television is all about," said NAB Executive Vice President Paul Haney.

"It would be the height of tragedy if Americans failed to learn a lesson from tonight's closed circuit gouge. What if the World Series or the Super Bowl or championship basketball followed this shabby cable-pay television pattern?

"To view this fight tonight outside of Madison Square Garden, the viewer must pay anywhere from $10 to $30 for the seat. The same wheeler-dealer interests promoting this effort tonight would, if they have their way, extract a fee from a man in front of a radio or television set in his own home a year or two down the road."

NCTA Reply

On March 8 the National Association of Broadcasters issued a statement on the Frazier-Ali championship fight blackout calling it a "shocking example of what cable-pay television is all about."

It is apparent that NAB is again engaging in another devious generalization designed to hoodwink the public on an emotional issue.

First, NAB finds it convenient to use interchangeably the terms "closed circuit" and "pay-cable television." The fact is, of course that the NAB is talking about three different industries—the CATV industry, the broadcast pay-TV industry, and the closed circuit television industry. NAB would do better to direct its remarks to the closed circuit TV industry, for it was the one involved.

Secondly, the Federal Communications Commission has rules regulating the broadcast of sports events over pay-TV and over cable TV where there is a per channel or per program charge. Those rules are more than adequate protection.

The rules prohibit CATV originations for which there is a per program or per channel charge of such sports events previously broadcast by commercial television stations in the preceding two years. Additionally, the FCC has proposed rules which would extend the time period to five years.

NAB attempts to create the impression that pay-TV and CATV should be the whipping boys for the fight blackout. We cannot speak for pay television, but the record clearly indicates that cable systems have gained nothing from the blackout.

NAB should look to the commercial television industry's "wheeler dealer interests" regarding blackouts. Broadcasters are the ones who sign contracts blacking out such events as the Super Bowl.

NAB is a staunch defender of the free enterprise system when it suits its purpose. Presumably broadcasters had the opportunity to bid for rights to the championship fight. That is the same kind of free enterprise opportunity they have to sign or not sign a contract that provides for a Super Bowl blackout or innumerable local blackouts.

NAB's remarks amount to nothing more than an opportunistic attempt to make PR points at the expense of cable television.

Radio Equipment List Ready

The latest listing of Radio Equipment Acceptable for Licensing, dated January 11, 1971, has been issued by the Federal Communications Commission.

The list includes equipment for the Domestic Public Radio Services other than Maritime Mobile; Radio Broadcast Services; Experimental, Auxiliary and Special Broadcast Services; Stations on Land in Maritime Services; Stations on Shipboard in Maritime Services; Public Fixed Stations and Stations in the Maritime Services in Alaska; Aviation Services; Public Safety Radio Services; Industrial Radio Services; Land Transportation Radio Servcies; and Citizens Radio Service.

The transmitters listed are considered acceptable for licensing in the various services provided that their operation is in accordance with Commission rules and the specifications for this equipment are not exceeded. The list also includes frequency and modulation monitors that all type approved for use in the radio broadcast service. Equipment is listed alphabetically by manufacturer and numerically by type number.

Copies of the list are not available from the Commission for purchase or public distribution. They are available for reference at the Commission offices at 1919 M Street N.W. in Washington, D.C. and at FCC field offices, and may be purchased from Cooper-Trent, 1130-19th Street N.W., Washington D.C. 20036 (Telephone FE 8-3800, area code 202). Inquiries, other than requests for purchase of the list, may be addressed to Technical Division, Technical Standards Branch, Federal Communications Commission, Washington, D.C. 20554 (Telephone 632-7093, area code 202).

JTAC Offers Spectrum Book

The Joint Technical Advisory Council (JTAC) gives a new authoritive look at the effect of space communication on one of man's natural resources in its recently released book RADIO SPECTRUM UTILIZATION IN SPACE.

This important new report deals with the variety of technical problems that are developing due to the added space use of radio spectrum. Included in this new reference volume are up-to-the-minute discussions of such problems as: Spectrum for space services in the 1970s; The multi-dimensional aspect of space and spectrum, relative to satellite communication; Considerations in antenna designs on both satellite and earth to provide the greatest spectrum utilization over the largest earth area; Effect of modulation techniques on the reuse density of the geostationary spectrum; Propagation effects; Considerations in the assignment of radio frequency spectrum to satellite and terrestrial users, including sharing criteria; Significant experiments that will affect communications in the 1970s.

With the increasing use of satellite communications, it is necessary to reevaluate the criteria for the various methods of using the radio spectrum. RADIO SPECTRUM UTILIZATION IN SPACE updates the JTAC's earlier report, RADIO SPECTRUM UTILIZATION, by taking into account the growing need to provide information to the telecommunication community on frequency management, and spectrum and orbit utilization for satellite services. Background scientific information and references have been included in the new volume to assist technical personnel in their day-to-day work.

Copies are available from the IEEE, 345 East 47 Street, New York, N.Y. 10017. Prices are: $12 per copy to members of IEEE and EIA, and $24 per copy to others.

Send Your Exchange Ideas to Broadcast Engineering Yes—We Pay

SCANNING THE CATV SCOPE

By Leo G. Sands

Monitoring Can Reduce Down Time

Down-time is costly in terms of end-user good will to a CATV system and a broadcast station. It should not occur, and it is not unavoidable.

When a CATV system stops functioning, the telephone starts ringing. The subscribers neither understand why system failures occur nor do they care. They are paying for a service and expect to get uninterrupted service, just as a movie patron does.

Long ago, when the author spent a summer working as a movie projectionist, a film break occurred. The audience became restless in a matter of seconds and the theatre manager stormed into the projection booth and yelled "this does not happen here!"

But it does happen in theatres, broadcast stations and CATV systems. The frequency and duration of down-time can be minimized, however, by adequate preventive maintenance and efficient emergency maintenance.

The failure of any one amplifier between the head end and the first bridger can cause shut down of the entire system. Beyond that point, an amplifier failure affects service to only some of the subscribers. But, this too can be serious.

System Reliability

System reliability could be greatly improved by providing a standby amplifier at each amplifier location and a standby power source at each power insertion point. But, this could be too costly and the complexity of the subsystem at each amplifier location could be excessive. Maximum reliability can only be achieved by paralleling two systems and then, perferably, via different routes. Since it is seldom economically feasible to install duplicate facilities, except perhaps at the head end, system reliability must be enhanced by other means.

Good maintenance requires qualified personnel, adequate test equipment and good management. Acquiring the test equipment is much easier than finding people who know how to use it effectively. Even harder to find is a good service manager who would usually also be the chief engineer except in the case of a large-city system.

The starting place is the selection of the service manager/chief engineer who for a small system could be the only technician on the staff. He should select the test equipment, hire additional personnel as required, make up the preventive maintenance plan, and decide where to look when a system fault occurs.

System Records

While paper work is the hallmark of bureaucracy, maintaining adequate records is essential. The first step is to prepare a large file card for each system component. An example of such a card is shown in Figure 1. The cards can be filed in the same sequence as the components are in the system. For example, if trunk amplifier No. 12 is a plug-in type and is currently the 12th one down-cable from the head end, its card should be moved to its proper place when installed at a different location. The same applies to plug-in modules which can be used in any of several amplifier assemblies in the system.

A flow-chart map of the system should be posted on the maintenance shop wall. The service manager can stick colored pins into the map to denote the locations at which attention is required—immediately or as per a schedule.

In time, the file card records will reveal the MTBF (meantime before failure) of the various system components and allow the service manager to determine what must be done to minimize system failures and how many spares to stock.

An adequate supply of spare amplifiers (or modules) and all other redundant system components is essential. While the rule of thumb is to stock 10 percent of each item in

(Continued on page 67)

Item description.....**Make**.....**Model**.....**Serial No.**.....

Date received .....**Date first installed**.....**at**.....

date	technician	work performed	Present location

Fig. 1 Example of system component maintenance record card

use, this may be inadequate in the case of some components and excessive for others.

Power Failure

If standby power is not provided at all power insertion points, a portable gasoline engine-driven generator or a battery-plus-inverter emergency power supply should be available for use during a localized utility power failure.

When a total system failure is caused by lack of power at a power insertion point or the head end or by the failure of a line amplifier, it may take quite some time to identify the point where maintenance is required.

Fault Alarms

The same is true of a microwave radio relay system. The failure of any repeater station can disrupt the entire system. For this reason, most microwave systems have standby equipment at all terminal and repeater stations. In addition, many also have a "fault alarm" system.

Fault alarm facilities can be added to a CATV system for automatic identification of the nature of actual or impending failures at the head end. Ideally, a fault alarm transmitter should be provided at every line amplifier location. The failure of amplifier No. 6, for example, to receive signals from amplifier No. 5, would cause an alarm signal to be transmitted to the central monitoring point. This would indicate that the trouble is between the input of amplifier No. 6 and the head end. The inclusion of fault alarm facilities at line amplifier locations, however, is not yet a common practice, and might not become one in the foreseeable future.

It is relatively easy to add a head end fault alarm system consisting of off-the-shelf hardware. It can consist of a battery of on-off or FSK (frequency shift keyed) tone generators and an FM channel modulator at the head end, as shown in Figure 2. At the monitoring point, an FM receiver (preferably fixed-tuned) and a battery of tone receivers are required, as shown in Figure 3.

The keying input terminals of the tone generators are connected to sensors which detect the status of any or all of the following: (1) utility power, (2) antenna tower lights, (3) building temperature, (4) building doors and windows, (5) AGC pilot generator, etc. The tone generators, can run continuously under normal conditions and report an off-normal state by absence of a tone. If of the FSK type, the "space" tone frequency would be transmitted normally, and the "mark" tone would be transmitted when an off-normal condition is sensed. The status of each monitored condition is made known to the service manager by indicator lamps. In case of unlawful entry at the head end, an audible alarm can be actuated.

To transmit quantitative information (voltage, etc.), any of the channels can be equipped with a pulse duration encoder at the head end and a pulse duration decoder at the monitoring point. Or, analog-type tone transmitters and receivers can be used.

Only one tone channel is required for a status reporting when electronic scanning is used as illustrated in Figure 4. The scan encoder samples each sensor in sequence and at each stop causes the tone generator to transmit a tone or shift tone frequency to denote an all-is-well signal. When an off-normal condition is sensed, the tone is not transmitted or shifted in frequency.

A tone receiver at the monitoring point senses the presence and absence of a tone, or a shift in the tone frequency. The scan decoder operates in synchronism with the head end encoder. The decoder controls status lamps for each step and can also actuate an audible alarm.

The tone generator can be connected to an FM channel modulator, as previously shown in Figure 2, and the tone receiver to an FM receiver, as previously shown in Figure 3. Since only one tone is required, an on-off keyed or FSK radio transmitter operating at some vacant frequency between 50 MHz and 220 MHz could be used instead of a tone generator. The receiver in that case would be a fixed-tuned

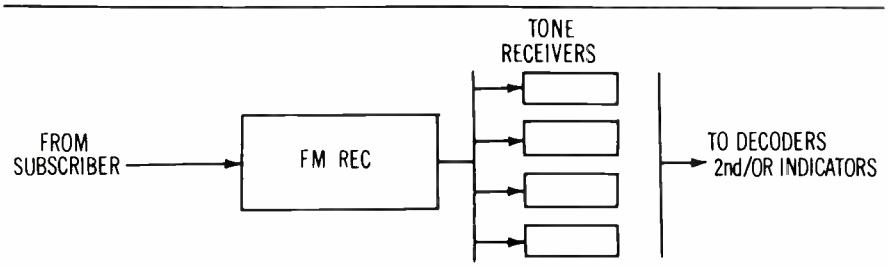


Fig. 3 Tone channels shown are for receiving telemetering and/or status signals from the head end.

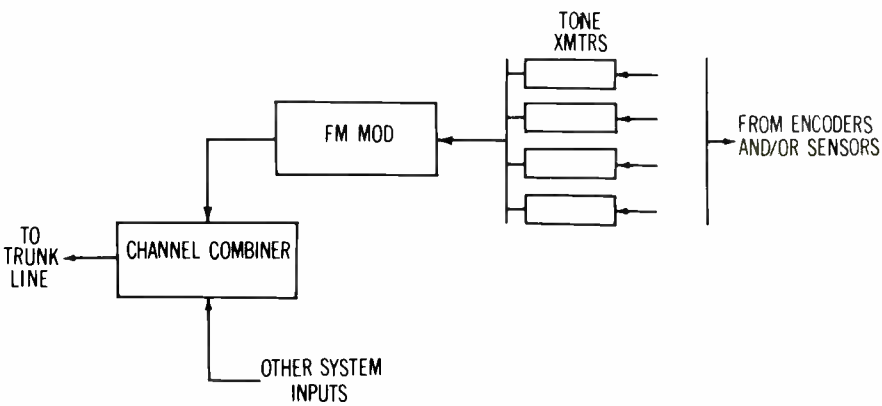


Fig. 2 Tone channels are used here for transmission of telemetering and/or status signals.

Convention Change

Due to the NCTA Cablecasting Seminar being scheduled at the same time as the annual OCTA convention, the Board of Directors decided to postpone the annual Ohio meeting.

The new dates selected are June 8, 9 and 10 in the same location, the Sheraton Motor Inn in Columbus, Ohio.

radio receiver equipped with a relay actuated by the presence or absence of carrier or by carrier frequency shift.

Receiver Monitoring

It could be very helpful to the service manager to be able to monitor the quality of all television signals being transmitted by the system with a minimum of effort. By looking at the television receiver screens he can quickly note any change in (or the loss of) any chan-

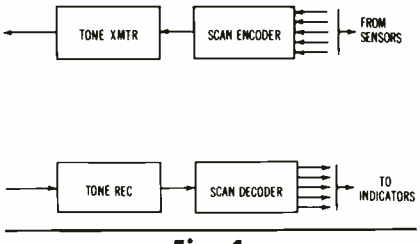


Fig. 4

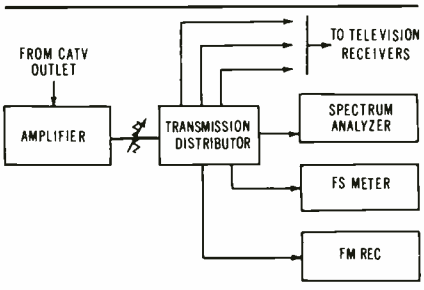


Fig. 5

nel, cross modulation, etc., and be given a cue as to whether there is head end or transmission system trouble.

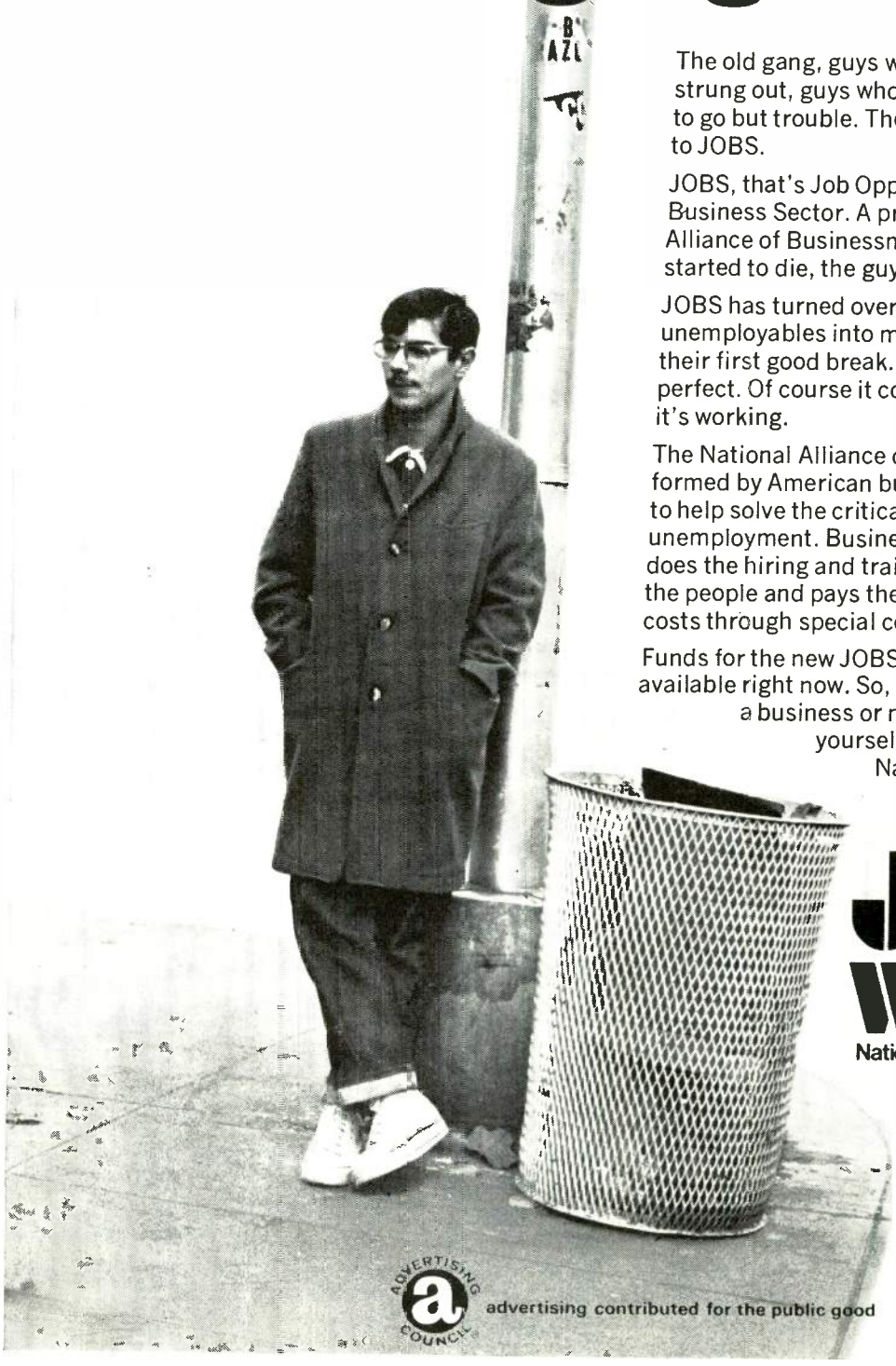
This can be done by providing a color television receiver for each TV channel, an FM receiver, a field strength meter, and a spectrum analyzer, connected as shown in Figure 5. The quality of the picture on each channel can be observed instantly on the receiver screens, the levels of the signals can be measured with the field strength meter and the pilot signals, and the presence of interfering signals can be observed on the screen of the spectrum analyzer.

The signals can be monitored at any location within the distribution system. But, more meaningful would the monitoring of signals at the far end of the system—the end of the feeder cable serving the most remote subscribers in terms of cable miles.

When the far end of the system is at a significant distance from the service department office, a microwave link or optical com-

(Continued on page 70)

JOBS is breaking up that old gang of mine



The old gang, guys who dropped out, got strung out, guys who hung out with no place to go but trouble. They went to work, thanks to JOBS.

JOBS, that's Job Opportunities in the Business Sector. A program of the National Alliance of Businessmen. The gangs have started to die, the guys have started to live.

JOBS has turned over 300,000 hard core unemployables into manpower. Given guys their first good break. Of course it isn't perfect. Of course it could be better. But it's working.

The National Alliance of Businessmen was formed by American business communities to help solve the critical problem of hard core unemployment. Business provides the jobs and does the hiring and training. Government finds the people and pays the extraordinary training costs through special contracts.

Funds for the new JOBS '70 contracts are available right now. So, if you're an employer for a business or nonprofit organization, do yourself a favor. Call your local National Alliance of Businessmen.

JOBS WORKS

National Alliance of Businessmen

ADVERTISING COUNCIL

advertising contributed for the public good

The Good Old Days of Radio...

Listen to the radio stations in your area any day of the week and the chances are you will find at least one presenting a program devoted to recordings of the Big Bands of the heyday of radio, that period preceding and including World War II when most of the performances were live. Audiences and sponsors alike are finding these programs interesting and the response from both groups has been enthusiastic.

Recording companies are offering re-issues of the original material and in some cases, modern versions for better sound. They are all evidence of a revival of interest in the period when radio was the dominant entertainment medium. Those were the days of the big names, bands, singers and comedians.

At the local level, many stations had a staff orchestra, some for playing jazz, others for symphonic programs. A few stations had their own dramatic groups. They all had their following of loyal fans who wouldn't miss a performance.

*Director of Engineering, WTIC-AM-FM-TV, Hartford, Conn. Pictures through courtesy of WTIC and NBC.

Those were the days that brought radio to its peak if the yardstick is audience size and popularity. But what about the technical facilities—were they of the same outstanding caliber as the artists and programs? A comparison with today's equipment may be surprising.

The major difference between the station of the 1930's and one of today would be found in the studios. Nearly every station had several studios of varying sizes. In New York and Hollywood the networks used theatres for programs presented before audiences. Use of acoustical treatment was generous and the studios would be considered "dead" by today's standards with little, if any, reverberation. No attempt was made to add synthetic reverberation, as might be done today, because it wasn't the sound wanted. Even recordings of the pre-war period were made without it.

The Control Room

The pre-war control room would be a surprise. Since quantity-produced consoles of stock design did not appear until the very late '30's, each station assembled its own facilities in terms of its requirements. Mixers were put together from individual faders, sometimes without regard to impedance matching rules. Amplifiers were stock items consisting of several basic types. Monitor loudspeakers were usually of the electro-dynamic or field coil type with the field coil sometimes connected as a choke in the power supply. Flat baffles were a favorite form of mounting the speakers because they could be hung over the window facing the studio. Performance left a lot to be desired.

The standard volume indicator or "VU" meter was adopted by the industry in 1939. Prior to that time many different instruments were used although the Western Electric 203-C and the RCA counterpart were the most popular. These were vacuum-tube voltmeters adjusted to read power levels when operated across a standard impedance. The useful portion of the meter scale was less than half of full scale. Ballistic characteristics were far from standard and the fact that they

Fibber McGee and Molly liven up their audience in this production back in 1939. Were these really the "good old days"?

Steve Lawrence sings during a broadcast of the current NBC Radio "Monitor" program origination. The modern format makes demands that equipment from the "good old days" never could have met.

Or Were They?

By Harold A. Dorschug*

contained a half-wave rectifier made the response dependent on the symmetry of the waveform. Many operators preferred certain pieces of equipment because they liked the action it contained, but this did not mean that its performance was necessarily correct. As can be expected, levels were erratic and transmitter modulation varied accordingly.

Microphones

Today's sound man would feel somewhat frustrated at the choice of microphones available to him in that earlier day. The mainstay of the studios was the ribbon or velocity developed by RCA and exemplified by the famous 44 series. This was an excellent microphone and its directional characteristics made it very useful in cutting out unwanted sounds from the sides. Its size and vulnerability to wind limited its use mainly to inside pickups.

Condenser microphones were actually an early development and were used to some extent in the early '30's. However, compared with today's versions, they were large, heavy and prone to create noise under humid conditions. Dynamic microphones also enjoyed popularity, chiefly for remotes because of their ruggedness. They were basically unidirectional in polar response.

For many years, phonograph records were frowned upon for actual broadcast use, due in part to questions related to license and royalty matters. The main source of recorded music was transcription libraries. These were services leased to stations and consisted of 16-inch discs. Some utilized a vertical cut or "hill and dale," while others had a laterally modulated groove similar to today's discs. Turntables had to be large to accommodate discs of this size and they were also heavy for speed stability. As a consequence, starting was usually slow. The tightly paced format so common today, would have been impossible to produce.

Heavyweight Remotes

Remote amplifiers were backbreakers in the literal sense. Weights of 35 to 50 pounds were common until just before the War. Add to this several microphones and stands, cables and headphones and you can see why only the bravest liked to do remotes.

The use of radio relays was limited to frequencies between 1.6 and about 3 MHz. This required relatively long antennas even when loaded with inductances which were difficult to mount. Skywave effects also occurred and frequently caused interference. Since AM was the only method used, the circuits were highly susceptible to noise.

These were the facilities that were used to give radio the greatness of its Golden Age—an expression so often heard these days. But what about radio today—Radio of the '70's with the biggest audience ever and more hours of broadcasting from more stations than ever existed before?

Modern Radio

Radio today is more efficient, more closely attuned to its audience and capable of doing a job not dreamed of in the pre-war days. Let's look at what the facilities in use today are like.

Studios are smaller. Talk programs have replaced live musicians and the facilities are arranged accordingly. Mikes are available with characteristics to match voices and patterns to minimize studio problems. Response is more uniform and satisfying.

Control rooms are a far cry from yesterday. Highly efficient consoles combine all necessary functions in space-saving arrangements and offer performance found only in the laboratory during the "Golden Age." The volume indicators with their longer scales and full-wave rectifiers permit level control of a high degree. Automatic gain adjusting amplifiers and limiters with fast attack time and reliable control permit high average modulation levels to be maintained with better service to the listener, particularly the mobile audience.

Turntables are smaller and faster in operation, resulting in a faster paced operation. Pickup arms and cartridges provide outstanding performance and permit maximum realization of recording quality. Recordings are smaller and storage easier.

The most outstanding development of the post-war period, aside from solid-state technology, has been the use of magnetic tape. When this invention was discovered in Germany by the armed forces during the war and later brought to this country, it opened up a new era in recording. Its use in cartridge form further extended its usefulness and we are on the threshold of even greater use of cassettes.

In the "Golden Age" stereo existed only as a laboratory toy. Today it exists in practice as evidenced by the daily schedules of hundreds of FM stations and it has given radio a new dimension. A four-channel version is making its appearance and will probably become commonplace in the not too distant future. Stereo transmission has brought with it a new set of problems such as cross-talk, channel separation and phasing, and it is a tribute to the broadcast engineers that they have taken these problems in stride.

Remote equipment has been reduced in size so that handling an

Editor's Note: There's one thing that hasn't changed much in radio. And that's radio's participation in serving the public interest during emergencies and disasters. Thanks to those who serve.

outside pickup is no longer fraught with physical hazards. The use of radio replay units is commonplace and today VHF FM equipment is found in many stations. Licensing regulations and procedures may be relaxed in the near future making possible even greater use.

Whenever the temptation to look back at those good old days occurs, take a look around you. Yes, radio was great in spite of technical limitations and the people who made it worked hard to overcome them. Today we are a long way down the road of progress. There is more to work with and the opportunity to go even further ▲

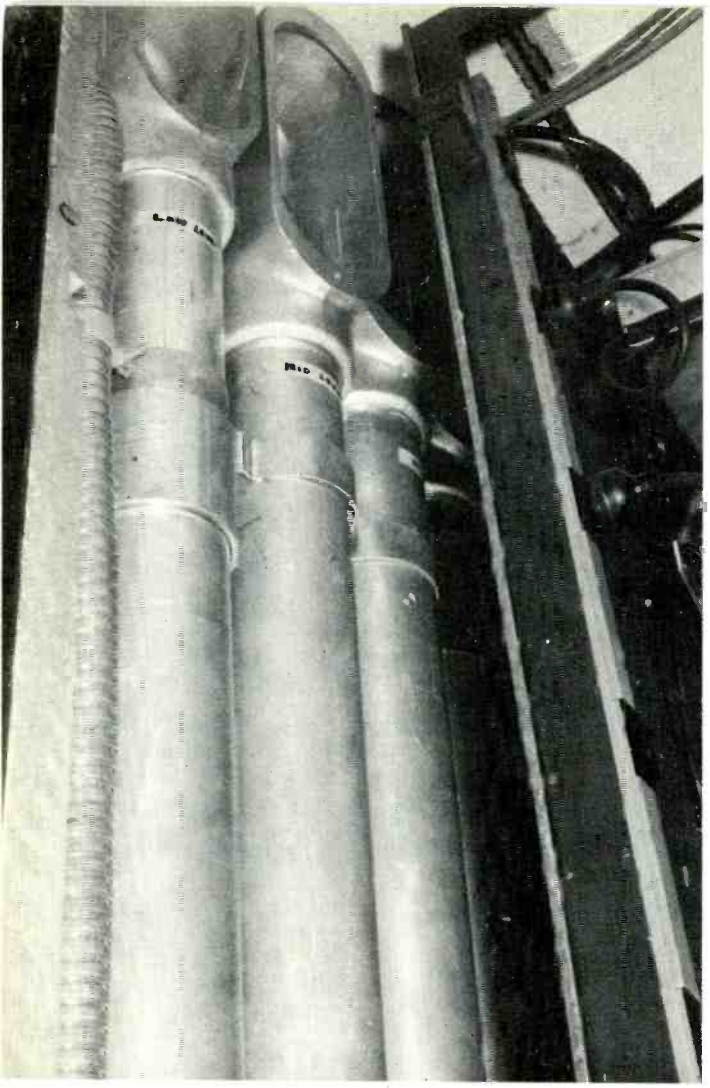
WTIC Studio D back in the 1940's. Control room is at left, observation room at right. The high ceiling and spaciousness were typical of the large studios of the time.

Engineer Bob Downes looks on as producer Bill Marks preps artists Jean Colbert and Ed Anderson. This WTIC studio is currently the largest of four, yet it is smaller and more compact than the shot of their Studio D back in the 1940's.

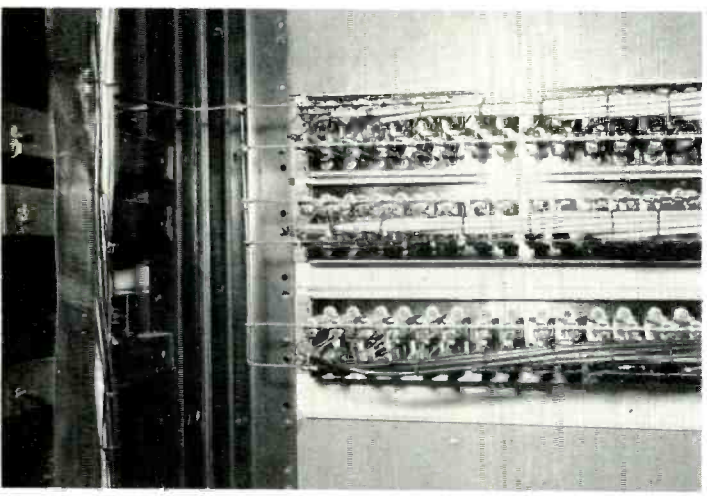
Remember the war bond drives? Here George Bowe interviews a crewman from a bomber squadron at Brainard Field, Hartford, Conn. The remote pickup radio relay equipment was built by the WTIC staff and carried in a panel truck. Ribbon velocity microphones were used in the field only when wind was not a problem.

WTIC newsman Larrye DeBeare describes action at a recent Greater Hartford Open Golf Tournament. The range and performance of this equipment is far superior to that used in the old days.

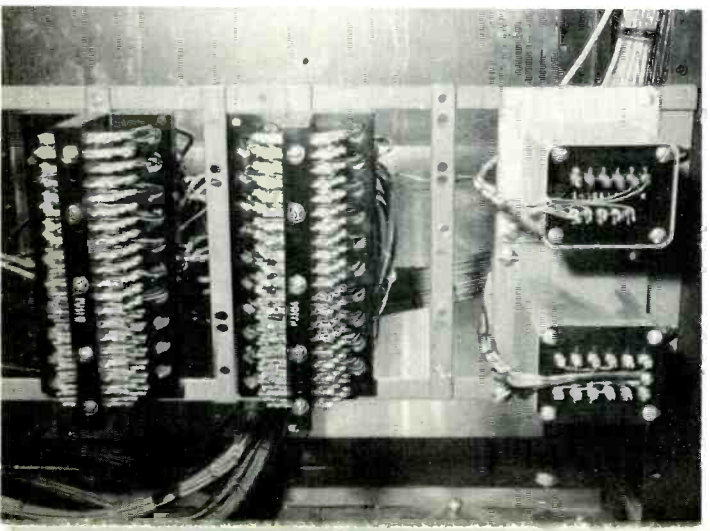
INSTALLATION



Conduit used to provide shielding, separation and protection of main trunk cables between Control Room and equipment rack room. These are 4-inch conduit, which allow room for future circuit and system expansion.



Jack field ground bus, using #14 copper wire grounded to the copper main rack ground that runs from the bottom to the top of the rack.



A balanced matching and a balanced bridging transformer mounted in the base of the rack, wired to the jack field. Audio terminal blocks are at left.

Whether a completely new station, a control room, or major section of a station is being built, or undergoing a renewal program, many headaches and problems in the completed project can be avoided.

This article will deal with audio facilities only. Several techniques will be offered along with a discussion of some of the basic installation principles. For those who are about to undertake a major installation project, the author hopes that the material offered here will make the job easier and the final completed project bug free.

A complete project can be divided into two major areas: planning and physical installation.

Drawings are a basic necessity if the overall system is to be understood. These drawings should be of the one-line variety for simplicity's sake. Schematic drawings provide too much information and are, therefore, too confusing as working drawings. There will be many occasions to revert to schematic drawings in isolated areas when the additional information is required.

The one-line drawings should include jacks and their assigned numbers, and system levels should also be shown along their paths.

Jack fields should be planned with most of the jacks assigned before installation begins. This planning will point up any difference between the number of jacks available for the circuits required to run on jacks. You may decide to buy more jacks or run fewer circuits through jacks.

Terminal blocks should be planned and assigned. This planning allows for circuits of different levels to be separated as much as posssible on the blocks. These block sheets should be filled in with circuit

*BE Maintenance Editor

By Pat Finnegan*

designations before installation begins.

The actual physical placement of equipment should also be planned. Where racks, amplifiers, jack fields, lighting relays and other equipment will be placed can have a definite bearing upon the number of circuit connections and on the total length of wire needed for the installation.

Rack mounted equipment should be planned so that everything will fit in the alloted space. You should always think in terms of future expansion and leave some extra space. Whether the racks are standard steel racks, turntable cabinets with rack space, the catalog spec sheets will tell the total vertical rack space needed. By totaling up the vertical space of all the equipment to be installed, you will soon know if you have enough space. Here is one area where planning pays off. It is better to discover on paper that adequate space is not available than to discover this after the racks are installed and possibly built into a wall.

There is one caution that should be observed when planning to intermix solid state equipment and tube or other heat producing equipment. Allot the lower section of the rack for the solid state and the upper section of the rack for the heat producing equipment. Solid state equipment is heat sensitive and should have free air circulation around the units.

While line diagrams give an overall view of the system, it is often necessary to revert to schematic drawings when getting into specific areas of the installation. Each individual project within the overall project should be preplanned before it is put together. These localized drawings should show what terminal numbers will be used, color codes of wires, what will be done with the shields at this point. Schematic drawings are necessary, especially if the equipment itself must be modified, or if special circuits are being added. Many consoles leave one or two switches that may be wired at the buyer's option. If such a switch is being wired into the system, a schematic should be drawn of exactly what is being done. It should be accurate and saved for future reference.

This brings us to the point of making changes. Regardless of how well a system may be preplanned, the final results always incorporate changes from the original plans. It is most important that changes be recorded immediately on the prints or other circuit diagrams or records, so that the records are accurate from the beginning.

After the system has been placed into regular service, a new set of drawings, block sheets and other records should be made from the working set. This will give a complete set of records of the way the system is built now. When equipment circuit modifications were made, these should have been entered on the equipment manuals' circuit diagrams. At the same time, the manuals should be marked to show what terminal numbers, transformer strappings, taps or other operational modes are in use. The objective is a clean set of records and supporting information that will be useful when troubleshooting is necessary. The working prints will have become marked up badly from making changes and other accidents may have happened to blur part of the print. Memory is a poor substitute for an accurate set of prints and records.

The planning and installation of a broadcast facility is somewhat similar to the equipment kits which are familiar to all engineers. In those kits, the Manufacturer's engineers have designed the circuits, drawn up instructions for assembly, collected the correct number of parts for each kit. The broadcast planner does much the same thing on a larger scale. He draws up plans, selects components of the system. The installing engineers are somewhat like the kit buyers, they follow the instructions and put it together from the instructions. Of course in most cases the broadcast engineer is also the designer.

Installation

This article won't recommend any particular brand of audio cable to use, only point out what to look for in the spec sheets. Manufacturer catalogs will give all the detailed physical and electrical specs and the recommended uses for their wire. There are many good wires available, so it won't be hard to choose one that will satisfy your installation requirements. For ease of stocking and quantity discounts, the selection of a common cable that will satisfy most of the installation requirements is a recommended move.

Shielded cables should be used whenever practical so there will be easier control of individual circuits and less problems with crosstalk. Low level circuits, such as microphones, should use a cable which has a low capacity across the cable and has a very high percentage of shield covering. Both these figures will be given in the cable spec sheets. Modern cables with foil type shield have 100 percent coverage.

Another consideration is an insulated shield on the wire. For a positive control over grounds, the shields should be insulated so that they do not touch other shields. More will be said about the controlled ground later.

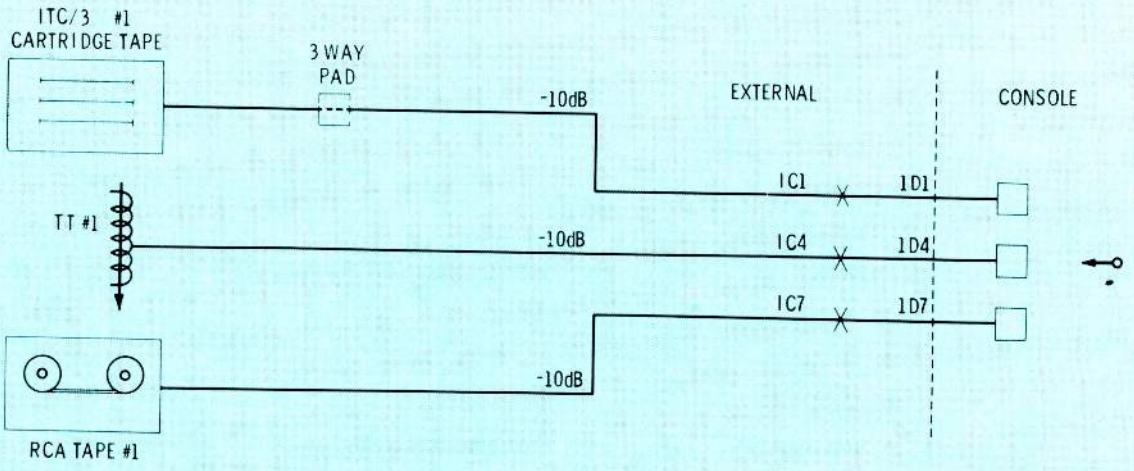


Fig. 1a Section of studio system diagram. Note the simplicity of using the one line method to reduce clutter and still show circuit paths, levels, and jack designations.

Separation of cables carrying high and low level information is most important for controlling crosstalk or hum from power circuits. Where long cable runs must be made of several differing level cables side by side, a metal conduit is the most protective as an isolation medium. That is, cables carrying high levels in one conduit, low level cables in another.

Ducts, trenches and raceways can also be used. When providing these cable run pathways for trunk circuits (as would be the case between a control room and an equipment room somewhere else) always make them larger than required for the original installation so that future expansion can take place with simple addition of circuits.

All cables eventually will telescope close together as they get to their designations, but the principle of separation should always be followed.

For example, one rack may have high level and the second rack low level circuits, or the same rack with high level at the top and low level at the bottom; one row of jacks for microphones, another row of jacks as far away as possible carries speaker leads; one audio terminal block at the base of the rack for low level, another for high level, or a single block with low level at one end and high level on the other end.

Even cabling within the rack itself can have some separation. High level wires may be laced together as one cable, while mid level wires laced together as another cable, and mike cables laced together to make yet another cable. The relative division of levels for separation purposes are four: group 1 low level, below –20 dBm; group 2, mid-level, –20 dBm to +18 dBm; group 3, high level, above +18 dBm; group 4, power. These are relative groundings, so a few dB one way or the other won't upset the system.

Building Ground

A successful installation requires that the system have a good grounding system, and it all starts with a common building ground. This common ground provides a ground reference for all the equipment and signals and with earth. Everything in the building should be grounded to this common ground, including the antenna ground system, if the transmitter is located with the studios.

This ground should be anywhere from a 2-inch to a 6-inch heavy gauge copper strap. If there are high power RF signals present and heavy machinery in use, a larger strap should be used. This strap should electrically be one continuous piece. When sections are joined together or many others grounds are attached to this strap, the connections should be silver soldered. At some point, this strap should be connected to a copper stage driven several feet in earth.

The main studio grounds, such as the console, each rack, etc. should be run with a heavy ground such as a 1 to 2-inch copper strap to the building ground. Where the strap attaches to the rack or console, the paint should be cleaned off the metal so a large contact area is made to the strap.

Shield Grounds

The Controlled Ground is usually the most successful method of handling cable shields. This method is a positive control and does not depend upon brute force contact of bare shields pressed against each other. It is most effective with balanced circuits.

The principle underlying the controlled ground is that grounding of the shield occurs **only at one end of the cable run.** The shields must be insulated from each other except at the one ground point. By not connecting the shields at both ends, there is no complete circuit for any currents that may be picked up on the shield. Currents that are picked up are not allowed to circulate through the shield system, but are returned to the main ground bus at selected points. The majority of audio cables available today have an insulated jacket covering them.

The total system will have several ground points and these should tie to the building ground. Such points will be the console, each rack, etc. A plan for the shields should be made before a group of cables are run. There will often be questions during the installation of individual circuits and which end to ground. Consistency is important. You may develop loop grounds; that is, complete shield circuits which may allow unwanted currents to circulate.

Roughly sketch the circuits using one line diagrams, indicate where the shields in that run will terminate. A common guide can be set up. For example, circuits to the rack will ground at the rack, to the console will ground at the console. Thus a mike outlet in the studio which goes in and out of a rack through a jack field will have the shield from the outlet grounded at

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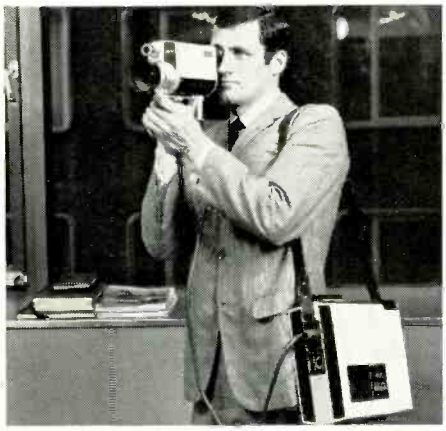

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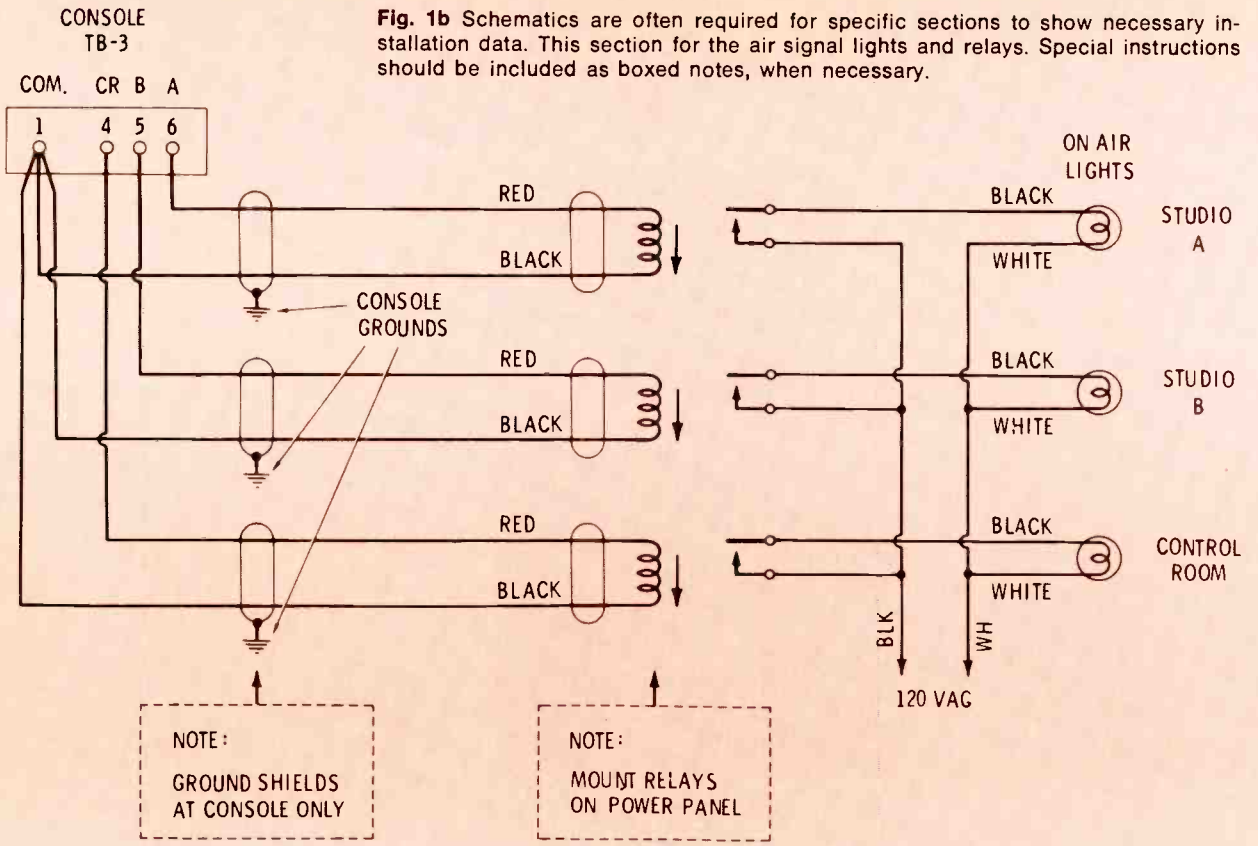


Fig. 1b Schematics are often required for specific sections to show necessary installation data. This section for the air signal lights and relays. Special instructions should be included as boxed notes, when necessary.

the rack terminal block, while the output side of the cable after passing through the jack field and on to the console, will have the shield cut off at the rack but the other end at the console will be grounded at the console.

System Levels

The levels throughout the system should be preplanned so that amplifiers and other equipment will be able to work with the controls at mid or ¾ position. Whenever possible, a standard level should be set up throughout the system, for example, +4 dBm, or another arbitrary figure. An amplifier that must work full gain to just get the job done will do much in deterioration of system signal to noise ratio. On the other hand, if levels are so high that controls must be just barely open, there will not be room for adjustment.

The most flexible system will use enough amplifier gain capacity so that it can be padded to a standard level and still allow the controls to be set about mid way to ¾ open. Such pads may be both balanced bridging or matching types as needed.

Proper impedance match and terminations through the system are other important considerations. If a circuit is not properly terminated or not terminated at all, levels will be inaccurate, and mismatched circuits will affect the high frequency response of the system.

Cabling Techniques

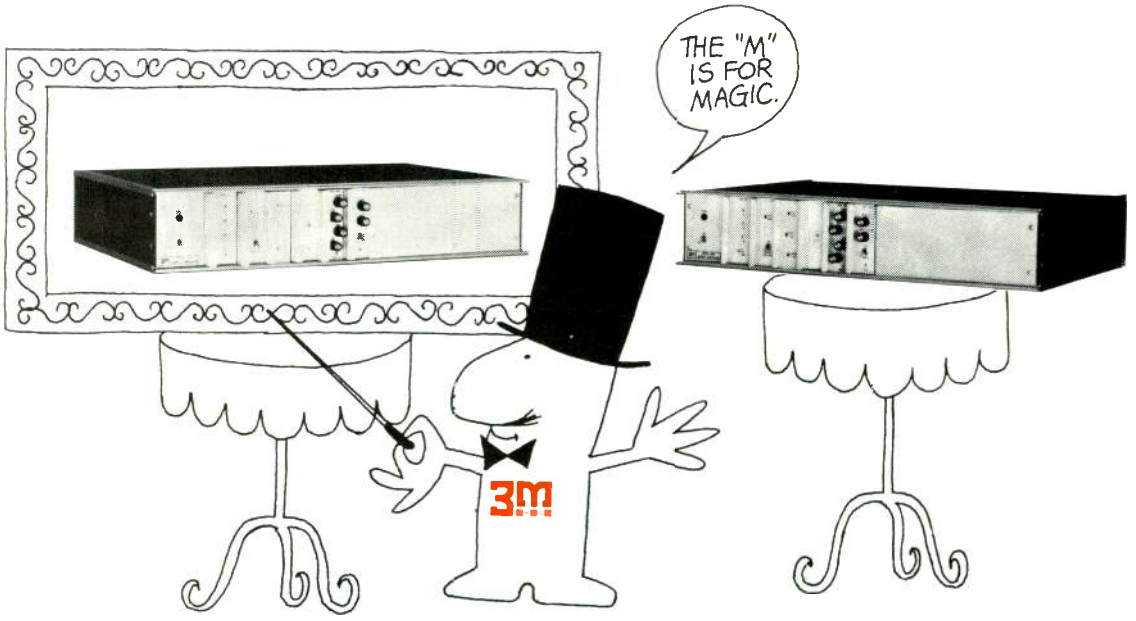
Pulling cable: When several cables are to be pulled through a conduit, try this method. Run the "snake" through first and pull in one cable. Pull that cable back out and use it as a measure (as a standard) for the remaining cables. To keep these from tangling, they may be taped at various places so as to make one large cable.

Tie the cable to the end of the snake, tape it on also to prevent the end from hooking other cables that may already be in the conduit, and then pull through. Cutting all the cables to length and pulling through at one time will save time.

Before bundling into a cable, the end of each line could be marked with one of the small stick on type labels. Another method to use, if no ready made labels are available, is the "ring out". There are two ways to do this. One method uses a small buzzer and headsets. The buzzer is similar to the type often used by telephone company installers. The buzler is attached to one pair of wires and the other end is found by listening on the pairs until the correct one is found.

The other method makes use of a short circuit on one end of the cable and an ohmmeter on the other end. In either of these methods, all the ends can be dressed and wired into their appropriate circuits at one end. One pair of wires is shorted at the end already wired in, and at the opposite end, the pair with a short is found with an ohmmeter. Once the pair is identified, wire it to its regular location. Hang the test leads of the ohmmeter across it and the short should still be there. Go to the other end and short another cable. Upon return to the other end of the cable, the ohmmeter should be reading open or the input to an amplifier, but not a short.

This ringing can be speeded up if all the cables are bared at the end at one time—not necessarily dressed for wiring, but the wires exposed and separated. If the lines are long enough to be on the floor, you can



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fan the cables out and hold them with your foot, meanwhile quickly running the test leads over the bared ends.

Jack Fields

New jack fields require many connections, but the work can move along quickly if motion economy and production line techniques are used. First, get the desired length of the "normal" jumpers. These can be made from scrap ends of the regular cable. Cut and bare the ends of each jumper, make enough to normal every jack in the field. Then solder jumpers to every normal, except those which are known for sure they will not be normaled. It is always easier to snip off the jumpers when not needed than to add them after the regular jack wiring is in place.

Grounds on modern jack strips are so designed that a piece of straight #14 bare copper wire will lay right across all the grooves nicely. This wire should be long enough to go to the rack main ground strap and soldered there, then to all the individual jacks. The bare #14 wire can be obtained from regular power wiring cable after the insulation is stripped off. Try not to bend it in the process. If it does become bent, it can be straightened out between a couple of boards and pounded straight with a hammer.

Shields at the jacks are normally cut off and not wired to the jack grounds. This is generally the case when terminal blocks are used at the base of the rack. The connection cable between jack and block has the shield grounded at the block.

Whenever there are hundreds of wires to dress, motion economy should be practiced to reduce the time required for the job. The desired length of cable to be stripped can be gauged for the first one, and some mark (a rivet, etc.) on the strippers used as a length gauge. The length of the individual wires can be done in the same manner, even if one should be shorter than the other. After a few of these have been made, you can soon "eyeball" the lengths and come in very close.

In the stripping action, first strip the outer cable, just enough to break and pull it apart about ¼ inch, then pull the wire out of the strippers and slide the case of the wire off by hand. Then strip the individual wires in the same way. The idea is to never let the jaws lock in their open position as this takes extra motions repositioning the wire. If the two wires are to be different lengths, crack the insulation of the short wire where it will be normally required. Lay the tool down and use the diagonals to snip off the shield (if not used) and the end lengths to correct size. In motion economy, the steps should be done in as few motions as possible. It takes a little practice, but you should develop motion economy as a habit.

Wire Length

It is not too difficult to get a neat finished appearance to any installation. It is simply a matter of taking a little care in the process. When a bundle of cables are cut, whether they be for long trunk cables or connecting cables between blocks and jack fields in a rack, the length of the first cable pulled that sets the size should be measured so that it will reach the greatest distance that will be encountered in that group of connections. Do not forget to allow for corners.

To start, all cables should be held together the same length by a piece of scrap wire or some tape. This will keep the wires from being

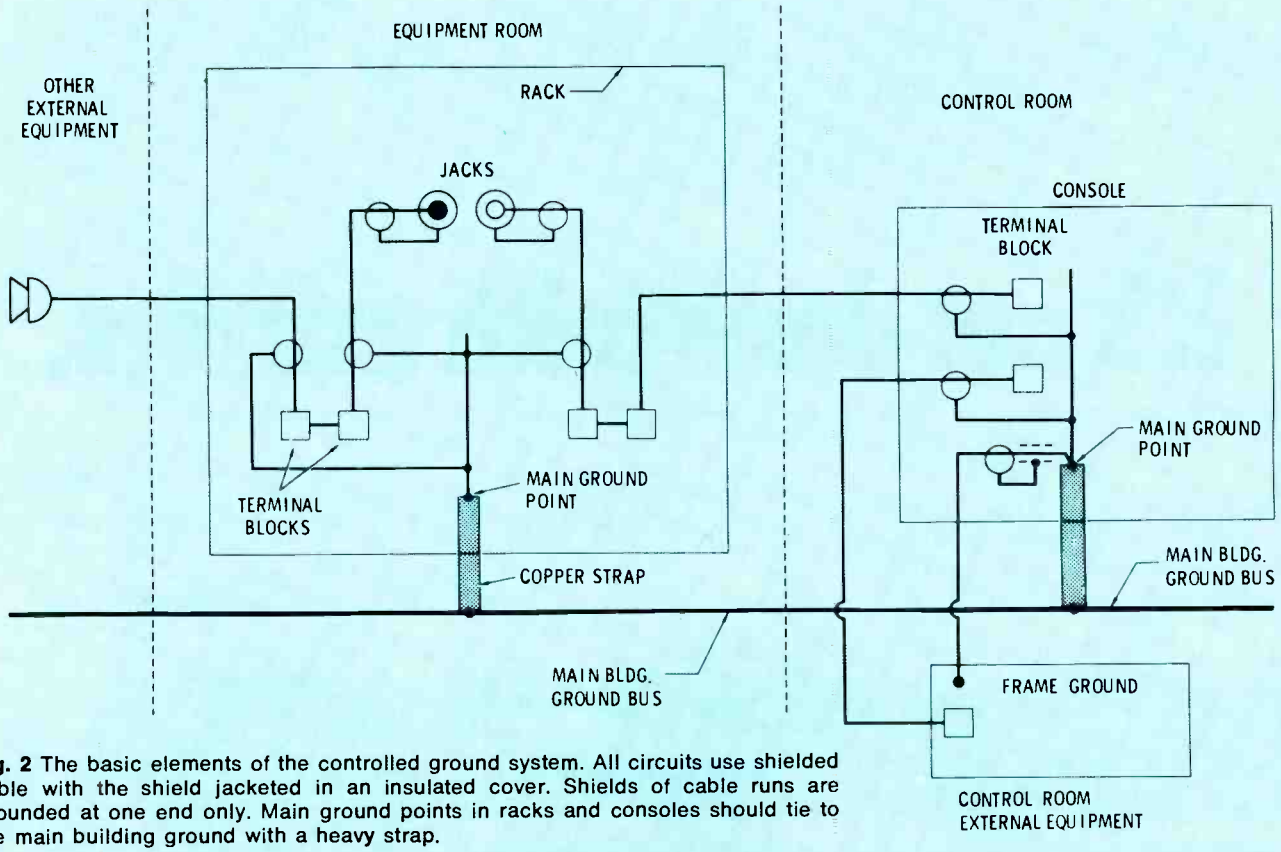


Fig. 2 The basic elements of the controlled ground system. All circuits use shielded cable with the shield jacketed in an insulated cover. Shields of cable runs are grounded at one end only. Main ground points in racks and consoles should tie to the main building ground with a heavy strap.

pulled out of the cable and ending up short on the other end. Dress the first one nearest the cable head, but make sure the cable head is secured in position so it won't move. Then dress each pair out a little longer each time so that the wires "fan" into the connections.

Transformers

There are many situations when a bridging, matching or isolation connection is needed immediately. Transformers mounted in racks with their input and out leads run to the jack field will provide these functions in a hurry when needed. Just make sure the jacks are labeled properly so that in operation, you won't connect a patchcord to the input of one transformer and the output of a second transformer. This same technique can be used for balanced pads if there are jacks available.

Remote switching of low level circuits: Sometimes it is desired that a low level circuit, such as a microphone, be switched on at a remote location and there is no way it can be done later as a high level signal. The circuit can be switched successfully, but care must be taken to prevent switching "pops". These will occur if the circuit is broken by the switch. In this circuit, the circuit itself is never broken, only a short is placed across the circuit or taken off. Usually a mike circuit will also have to switch the speaker muting relay, so use an RC filter to reduce any interference from switching the DC relay.

Mixing

There are occasions when it is desired to mix two circuits into one circuit without cross feed on the two circuits. A simple pad of three resistors will do the job and there will be no cross feed between the two circuits, while each will feed into the single channel. There is a 6 dB loss in the pad. The circuit can also be reversed, that is, one circuit can be split to feed two circuits.

Another pad of the same type can be used in tandem with the first so that three circuits can be switched or mixed into one circuit. In that case, the output of the first pad becomes one input of the second pad. For the two outputs that will be going through both pads, there will be 12 dB loss, so the third input level must be dropped by 6 dB if all are to match. The three resistors in the pad should be as nearly identical as possible.

RF Fields

Strong RF fields will effect transistors as the transistor can act as a detector and introduce cross talk, or it can act as a rectifier and create DC voltages in the transistor circuits and change their bias and possibly cause distortion. Good shielding around cabinets containing transistor amplifiers should be maintained. There are times, however, when the RF will be carried on the line to a transistor stage. When this happens, a small value capacitor can be shunted across the line as near the transistor as possible. Its value should be low enough that it will not affect the audio frequencies, but large enough to short the RF.

In summary: much emphasis has been made on preplanning every step of the way, keeping accurate records, control the grounds, and separation of signals according to levels. Carelessness in these areas is simply planting seeds which will grow into hum, crosstalk, oscillations from feedback and more gray hair. ▲

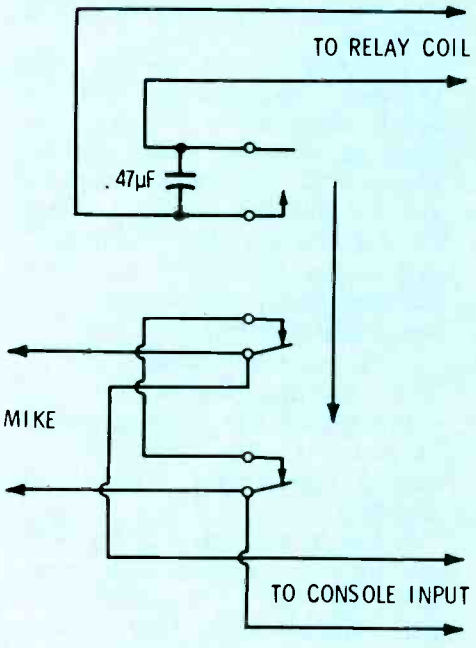


Fig. 3 A circuit which can be used for switching a low level mike circuit without pops. A lever switch is used that will add or remove a short across the circuit without breaking the circuit itself.

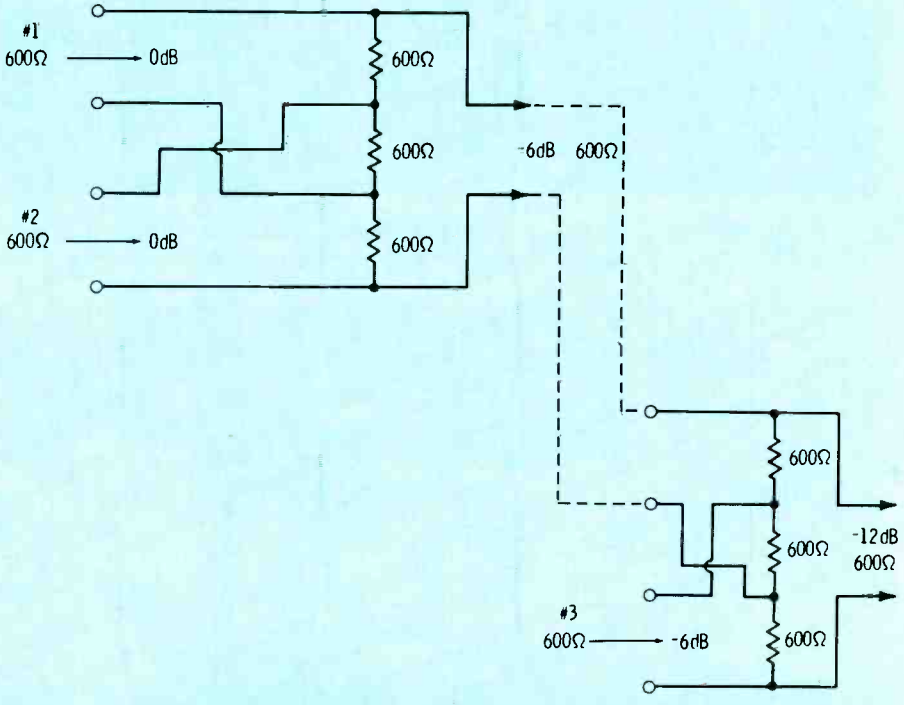


Fig. 4 A simple, inexpensive circuit that will permit feeding two circuits into one circuit without crossfeed of the input circuits. There is a 6 dB loss across either input to output. If three circuits are required to be fed to a single input, a second pad may be used, with the output of the first pad as its #1 input. There will be an additional 6 dB loss, and the output to #3 input must also be reduced 6 dB to balance the circuit.

Arraying Yagi For Positive

By James Emerson

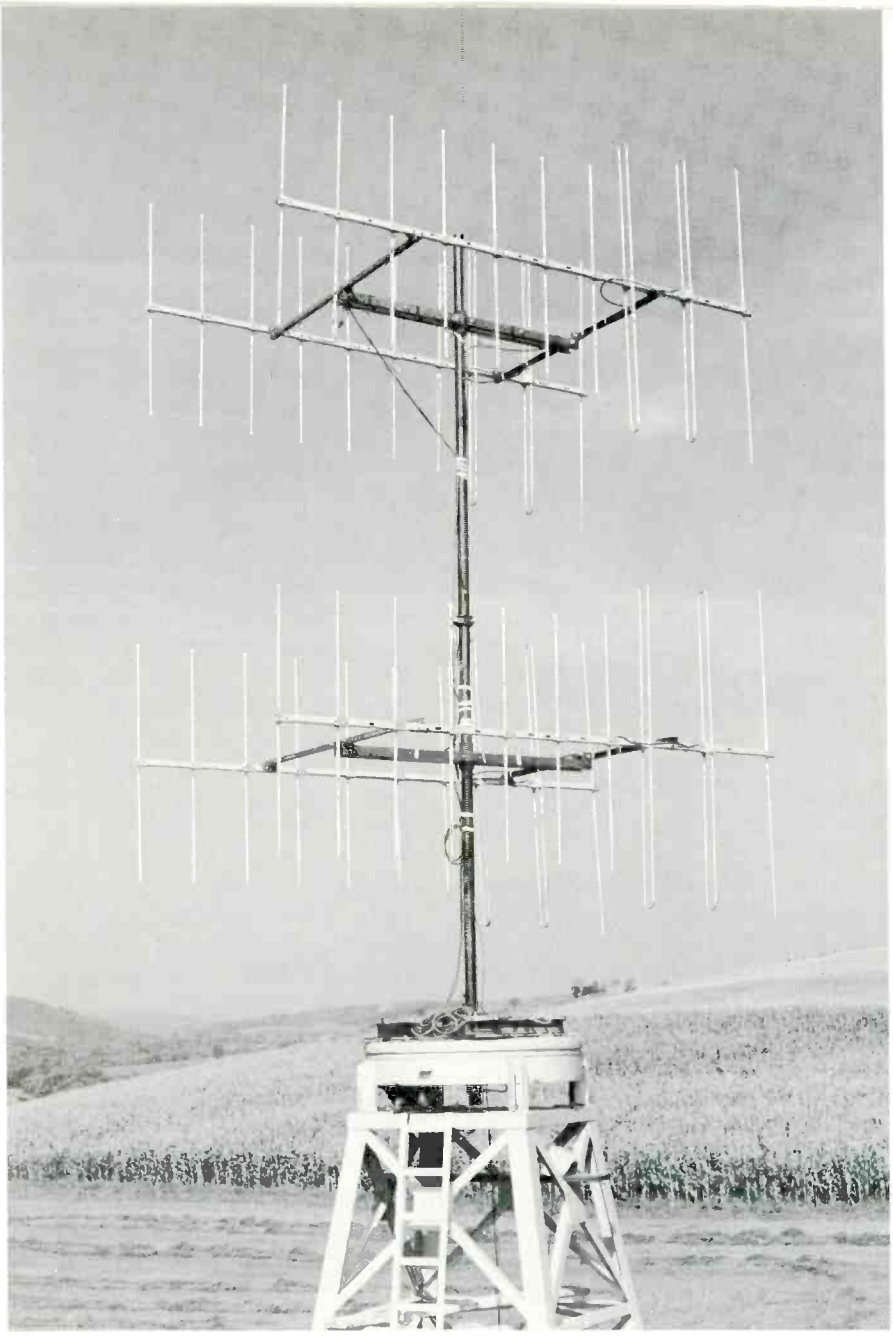


Fig. 1 The yagi antenna, designed and arrayed to take the "black magic" out and get gain, directivity, desired patterns and reduced interference.

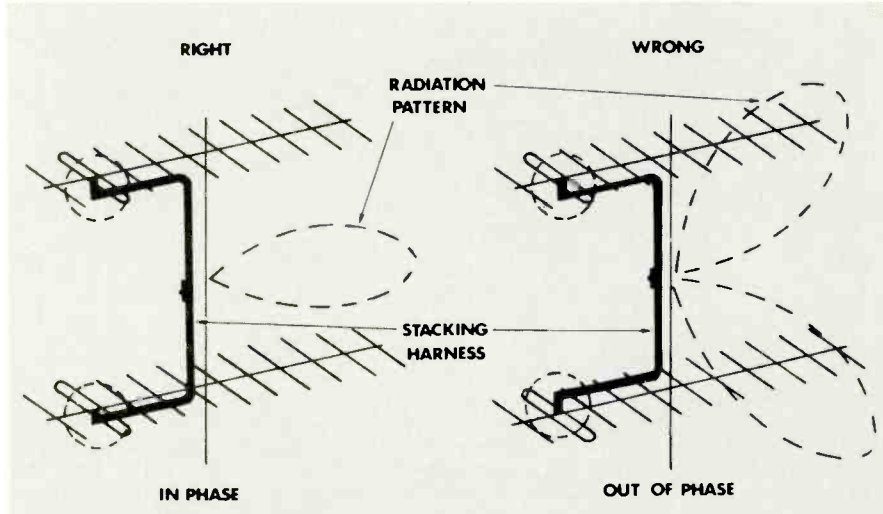


Fig. 2 Stacked yagis showing in phase and out of phase orientation.

The recurrent rumors that working with yagi antennas requires liberal administration of the black arts precipitates this discourse. For the sake of brevity, it is assumed that you are basically familiar with the characteristics and terminology of directional antennas. Successful stacking of multiple yagis requires, at worst, a nominal knowledge of directional antenna principles and about 20 years of experience. However, the essence of that experience is summed up in the following paragraphs. Use it in good health!

Generally, there are three basic purposes for arraying multiple yagi antennas. These are for: increased gain and directivity; attenuating interfering adjacent or co-channel signals; and achieving a specific desired radiation pattern of greater or lesser azimuth-beamwidth coverage.

The methods for stacking each of these configurations will be briefly discussed to cover the majority of situations which may be encountered. For complex antenna system problems, always consult the experts. It's not "witchcraft," just the fact of a great number of variables which may require highly specialized expertise.

General Rules For Stacking Yagis

Always use like antennas within an array; that is, of identical frequency range and number of elements.

Where a yagi has a balun built into its driven element, it is asymmetrically fed. Consequently, always position each such antenna within the array for identical orientation. Failure to do so will result in materially reduced array-gain caused by the out-of-phase orientation. See Figure 2.

Always adhere to array spacing dimensions given by the manufac-

Antennas Results

turer to avoid structural pattern interference.

Note that each time the number of like antennas is doubled, an increase in forward gain of 2 to 3 dB may be expected and the HPBW is halved, as shown in Figure 3. Theoretical gain is, of course increased by 3 dB, effectively doubled, but this is attenuated by the magnitude of coupler and line losses.

Conversely, power is divided in half on each leg of a pair. Thus total power applied to the array may equal the number of antennas within the array times the single antenna power rating. However, in no case may the power rating of a single antenna or stacking line be exceeded. See Figure 4.

With reference to Figure 4, it can be seen that the total power rating of the antennas (A) exceeds that of the stacking harness; therefore, either the applied power must be less than maximum for the antennas or optional high-power rating stacking lines used (B).

Figure 4 shows that in this example, stacking lines of higher-power rating used in the first leg would permit loading the array up to each individual antennas rated capacity. Special high-power antennas and stacking harnesses are usually available from manufacturers on special order.

Note that with regard to patterns, the E-plane is coincident with the plane of the antennas elements and crossarm, while the H-plane is orthogonal to them. Thus, with a horizontally polarized yagi, as in CATV service, the E-plane is the horizontal plane and the H-plane is the vertical plane.

For vertically stacked antennas, the vertical plane pattern becomes narrow and more directive, and vice-versa. For example, a single pair of vertically stacked 10-element yagis give half-power cover-

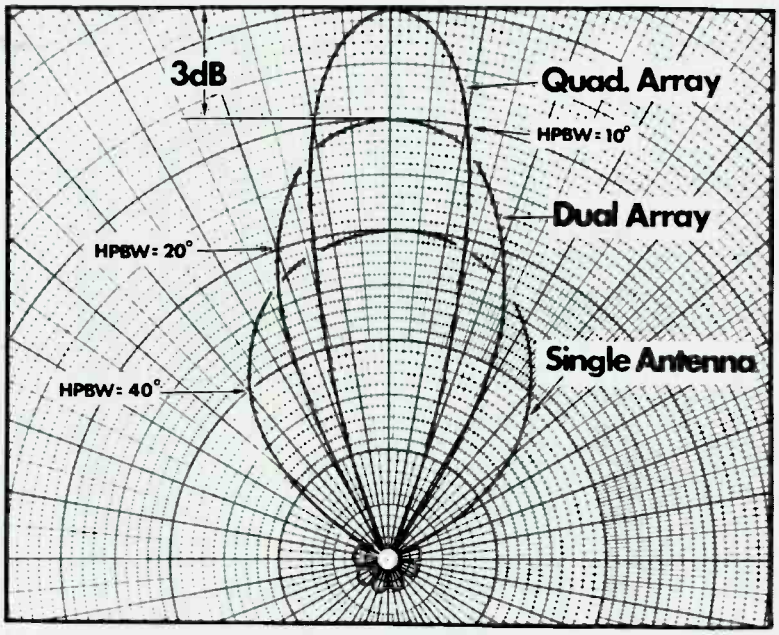


Fig. 3 As the number of like antennas is doubled, an increase of 2 to 3 dB forward gain may be expected, while the HPBW is halved.

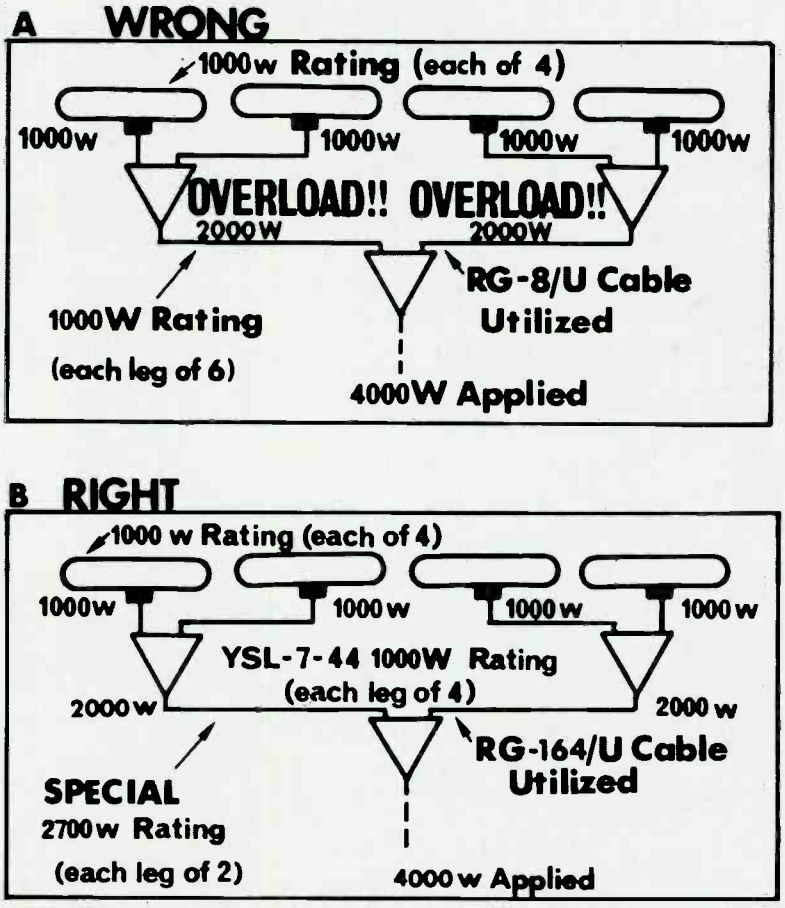
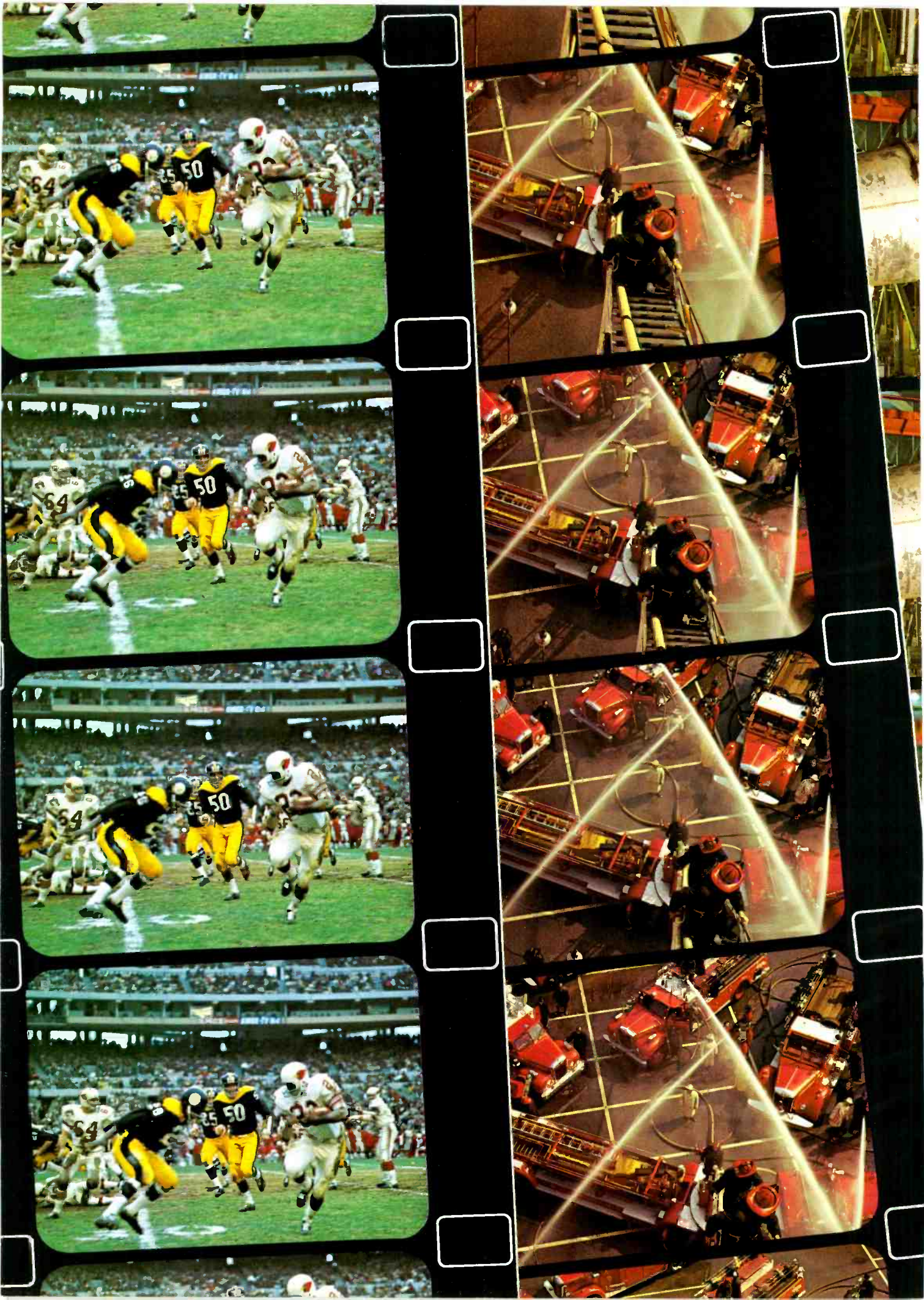
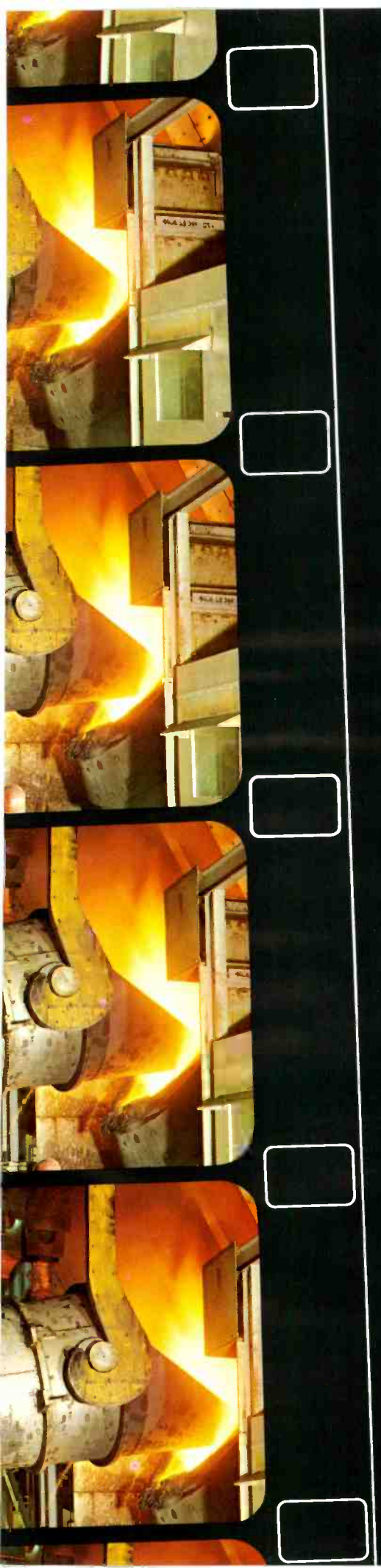


Fig. 4 Stacking lines of higher power rating used in the first leg permits loading the array up to each individual antenna's rated capacity.





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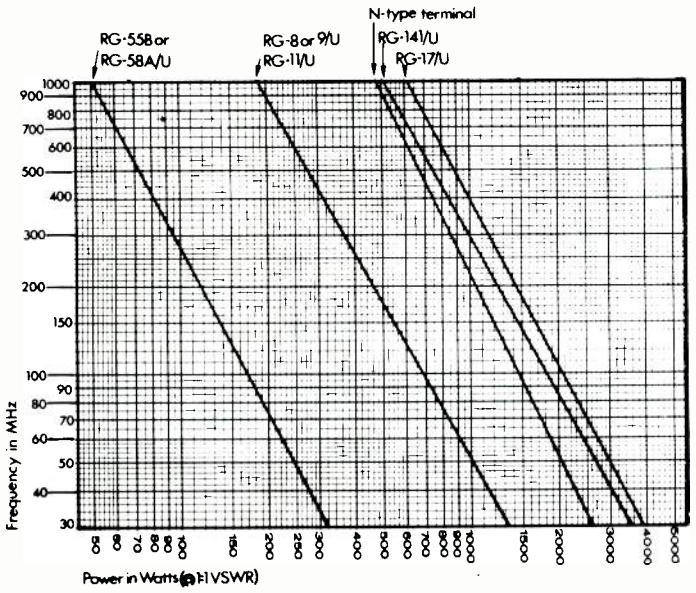

Fig. 5 Frequency/power ratings for various coax cable.

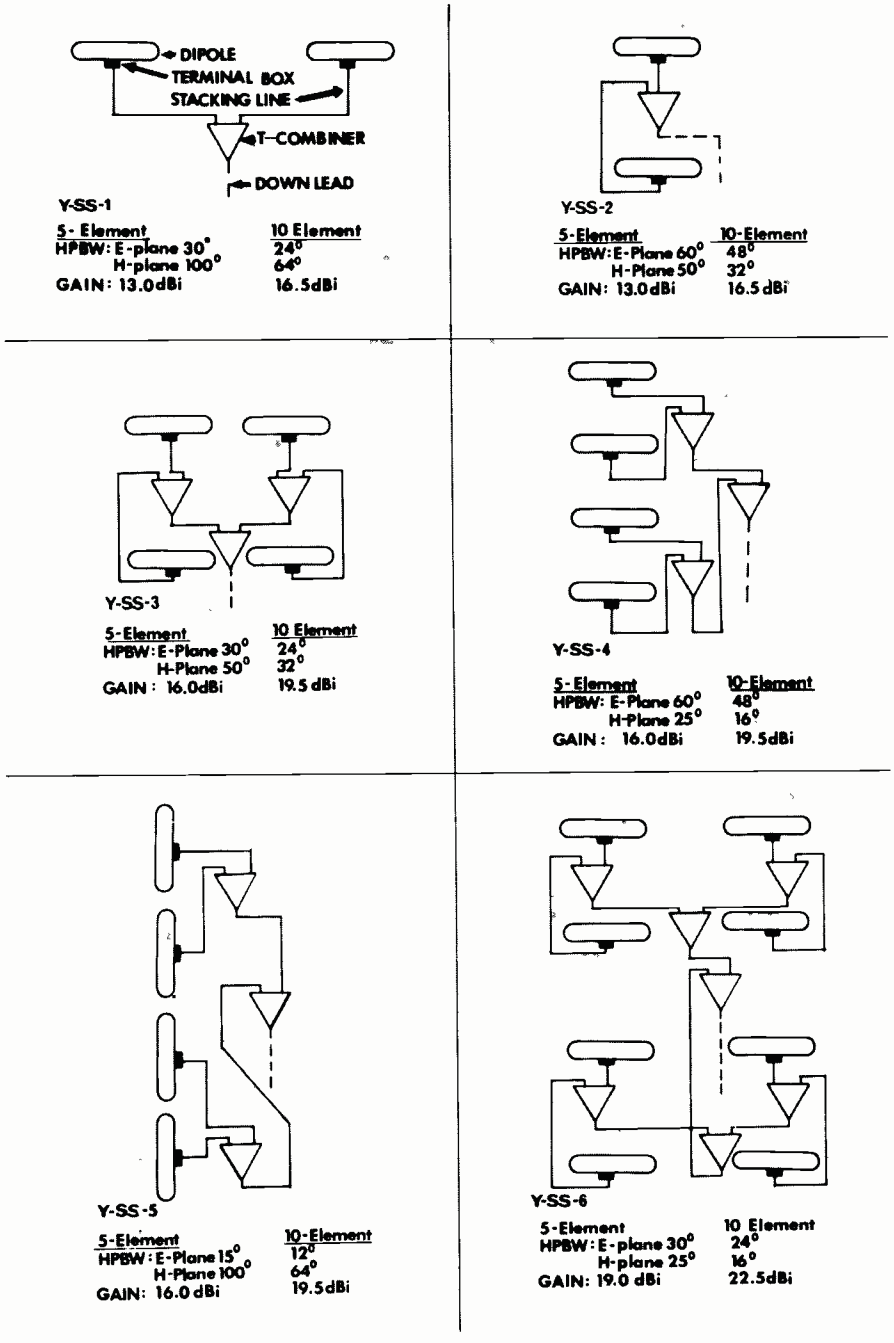

Fig. 6 Stacking and coupling arrangements for 5 and 10 element yagi antennas.

age at a distance of 4-times the antenna's height above the average terrain, while a vertically stacked quad array's half-power point will be a distance of 6½ times the antenna's height.

In some instances it may be desirable to "tilt" or depress the front of the entire array in order to achieve better coverage close-in to the antenna. In no case should the tilt angle exceed 7.5 degrees for dual vertical arrays or 2.5 degrees for quad vertical arrays, at the risk of inducing phase distortion into the received signal.

Gain and Directivity

First, refer to Figure 6 in order to become familiar with the symbolization given. It now remains only to select the appropriate array configuration, then the actual hardware, for your gain and directivity requirements. Note that the HPBW and Gain figures given pertain to specific TACO antennas. They should be reasonably accurate for any high-quality yagi. Also note that either of two coupling or combining methods may be used.

In one method of combining, a separate directional antenna coupler or splitter is used for each pair of antennas. The device exhibits the same terminal impedance as the antennas and is interconnected by non-critical lengths of coaxial cable. Of course, each pair of like cables must be of equal length, but total cable length within the array is relatively unimportant. This method is normally used in stacking 75-ohm impedance receiving antennas.

A second method of combining may be utilized with antennas of 50-ohm impedance. This method, developed for TACO antenna systems, involves the use of odd quarter-wavelength multiplies of 75-ohm cable with a common "T" connector for each pair. This provides a lighter and less expensive method than by using separate antenna couplers. These coaxial stacking harnesses, by virtue of their characteristic impedance and length, step up the impedance of each leg

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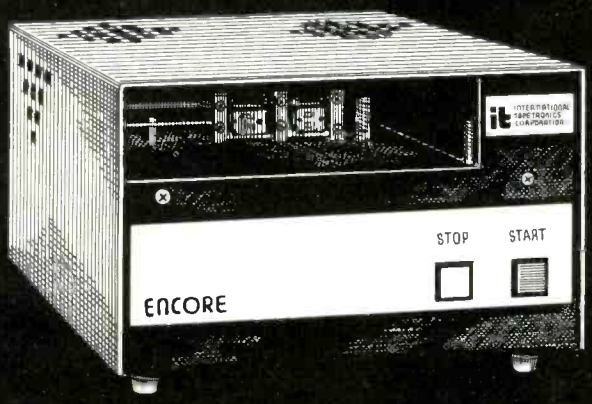

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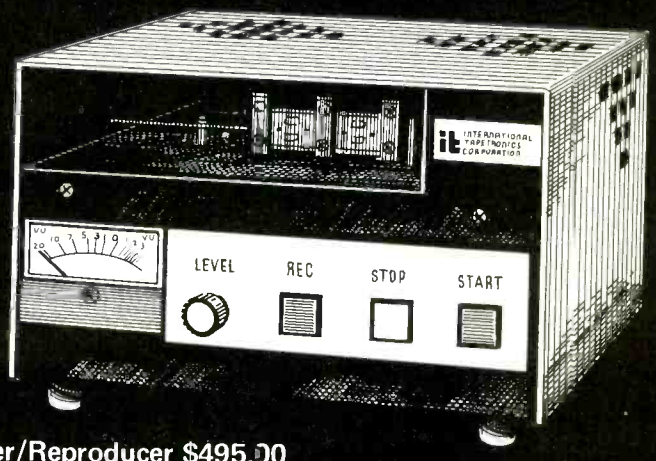

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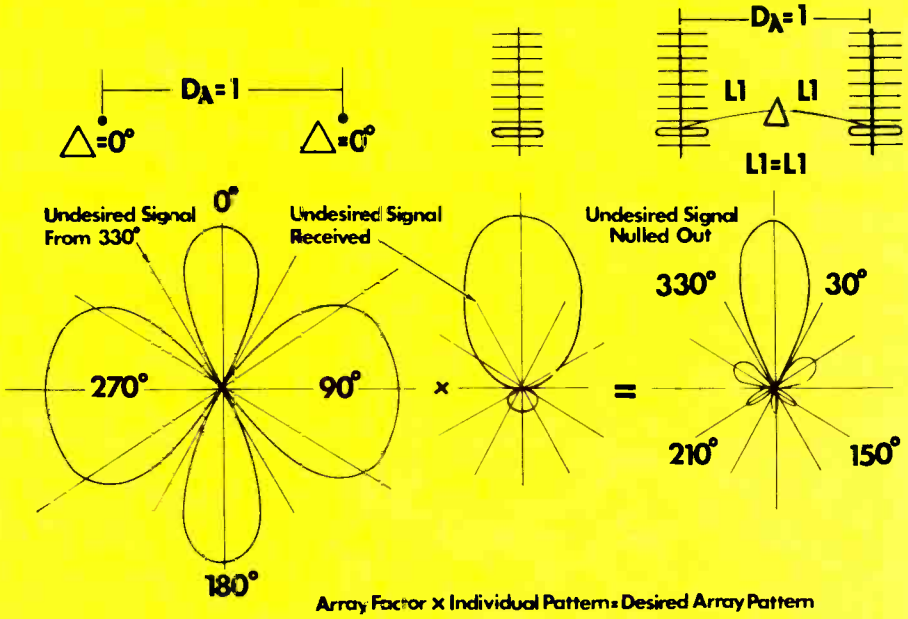


Fig. 7 The horizontal displacement is used to place the pattern null at precisely the arrival angle of the undesired signal.

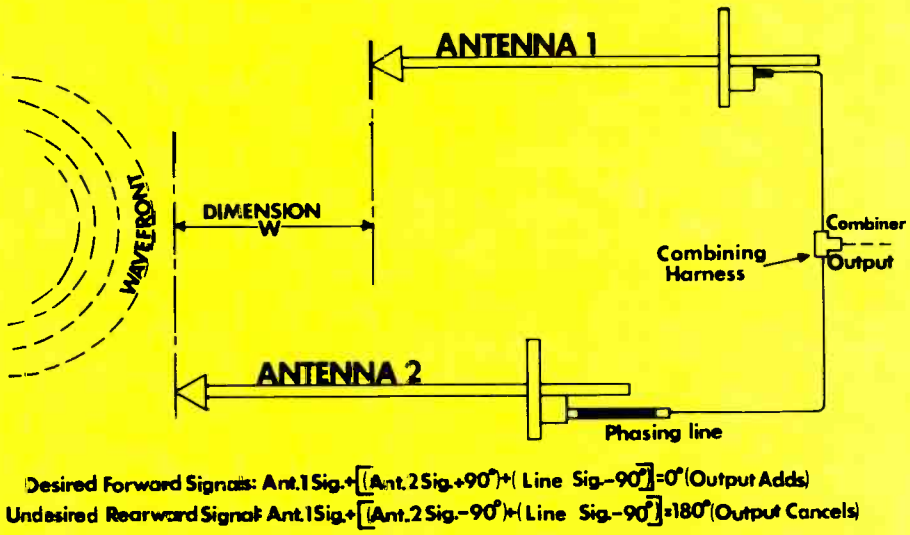


Fig. 9 Dimension "W" represents a 90 degree difference between the two antennas interception of common signal or wavefront. Antenna #2 is equipped with a 50 ohm phasing line whose electrical length is equal to dimension "W".

Fig. 8 Spacing distance between antennas in wavelengths for placing the null at the arrival angle of the undesired signal.

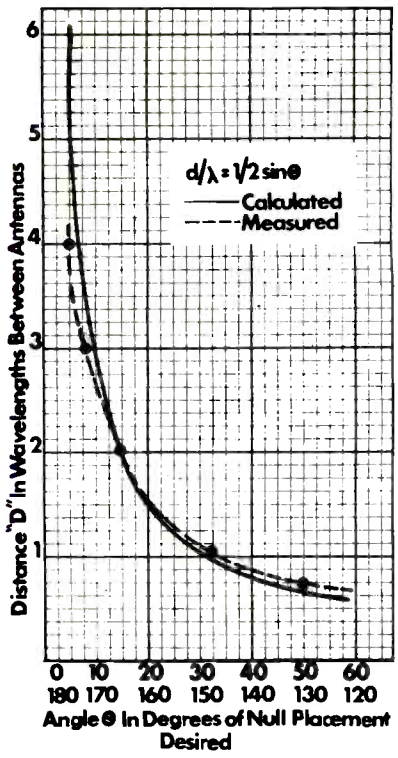
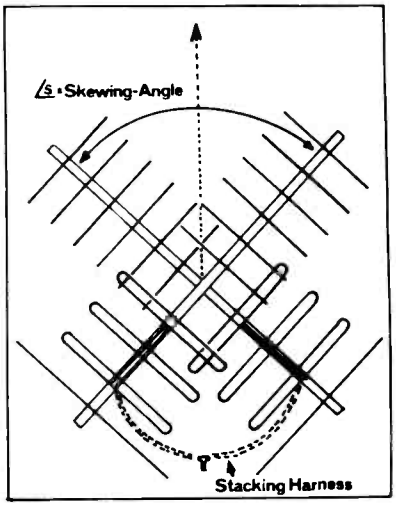


Fig. 10



to 100-ohms. When the two legs are joined at the "T" connector a 50-ohm impedance results.

Mechanical Considerations

The details of physically mounting yagi arrays are available from individual antenna and/or tower manufacturers. These can range from simple dimension drawings to complete handbooks, such as TACO's.

Normally, two-inch O.D. (1½ in. IPS) pipe and commercially available hardware are used to construct the necessary booms, gates and masts for mounting an array upon a tower.

Each array poses a different set of requirements so no attempt will be made to cover interface design. The cleanest approach must be to utilize the services of a mechanical engineer. Factors such as total weight and windloading are critical and require extensive computation. Careful design will ensure long array life without incurring electrical (pattern) interference from the array mounting structure. For this reason, observing the recommended spacing dimensions of the manufacturer becomes extremely important.

Proper assembly of an array is also important for achieving freedom from wind-induced resonance or mechanical vibration. High-quality yagis are designed to avoid such resonance and the array structure should be so designed. Even to securing coaxial harnesses along framework wherever possible. A loosely assembled or improperly designed array can literally shake itself apart upon reaching its resonant (mechanical) frequency in certain wind conditions. Murphy's law usually prevails.

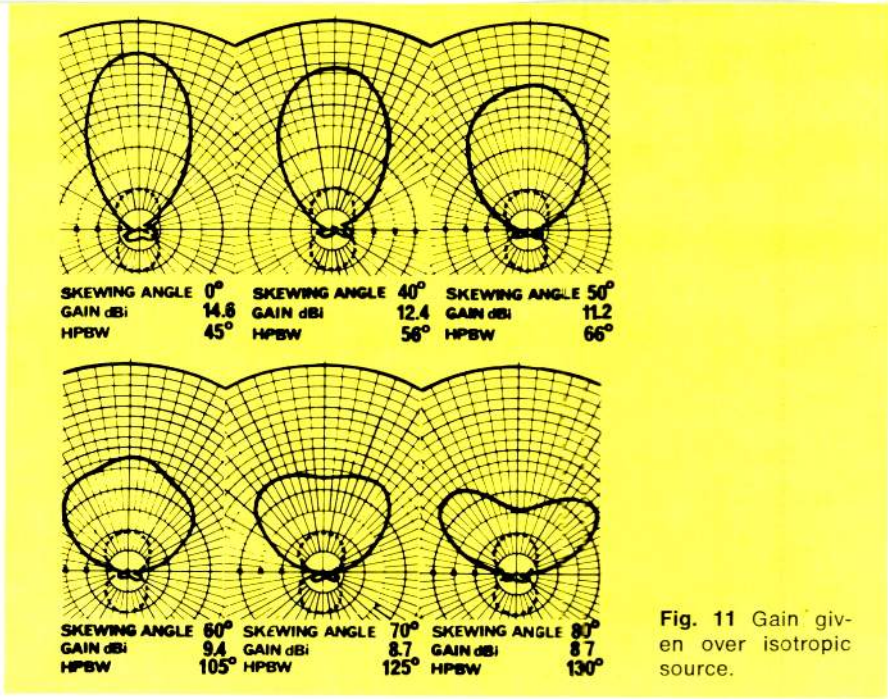


Fig. 11 Gain given over isotropic source.

Attenuating Interfering Signals

Two methods are described here for phasing-out adjacent or co-channel interference, and are particularly relevant to off-the-air TV pickup as found in CATV systems. The first method pertains to undesired signals from a forward direction, while the second method concerns eliminating rearward interference. Either method effectively increases the desired-to-undesired signal ratio of the system to the 40-50 dB required for optimum discrimination.

Phasing-Out Forward Interference

This method, of horizontally displacing two identical antennas or vertically stacked bays, provides optimum results where the desired and undesired signals arrive at angles of from 5 to 60 degrees apart and where the two signal levels exhibit a 10 dB or greater difference.

The horizontal displacement is used to place the pattern null at precisely the arrival angle of the undesired signal, as shown in Figure 7. Since the pattern null is exremely sharp, exactitude is of prime importance. Skewing of a single antenna is usually not a satisfactory procedure, except for very small increments of skew, as the main lobe is displaced and forward gain is subsequently reduced.

First, using a single antenna at the desired mounting location of the array, determine the exact arrival angles of the desired and undesired signals.

Second, refer to Figure 8 and carefully note the spacing distance in wavelengths for placing the null at the arrival angle of the undesired signal.

Third, place the single antenna first in one position then the other of the two intended mounting locations determined by the spacing distance found above, and measure the undesired signal level in each location.

If the two signals are within 0.5 dB, the array may be installed at this location. If not, adjust the single antenna both vertically and horizontally (observing proper spacing) until the difference between the two undesired signal measurements is minimal. Then install the array.

Next, observe the desired video signal. If there remains minor interference, adjust the entire array in azimuth **very slightly** to maximize undesired signal rejection. If there remains considerable interference, it may be necessary to install a means for adjusting relative phasing between each leg of the array. In such instances it is recommended to consult the manufacturer's engineering staff.

Phasing-Out Rear Interference

Where interfering signals are arriving from behind the antenna or array, and a very high front-to-back ratio antenna such as a screen-reflector type cannot be utilized, the following method is recommended. Refer to Figure 9 and note that dimension "W" represents a 90 degree difference between the two antennas interception of a common signal or wavefront. Also note that antenna 2 is equipped with a 50-ohm phasing line. The electrical length of this line is equal to dimension "W".

From a forward direction, the desired signals at the output of antenna 2 lead those of antenna 1 by 90 degrees. However, a 90 degree lag is induced by the phasing line behind antenna 2, resulting in the signals of both antennas being in-phase at the "T" combiner of the stacking harness.

From a rear direction, the undesired signals at the output of antenna 2 lag those of antenna 1 by 90 degrees. A further 90 degree lag is induced by the phasing line behind antenna 2, resulting in the signals of each antenna being 180 degrees out of phase with the other at the "T" combiner of the stacking harness, thus cancelling each other.

The degree of rejection will be directly proportional to the rearward interception angle of the undesired signal. Rejection being maximized directly behind the array.

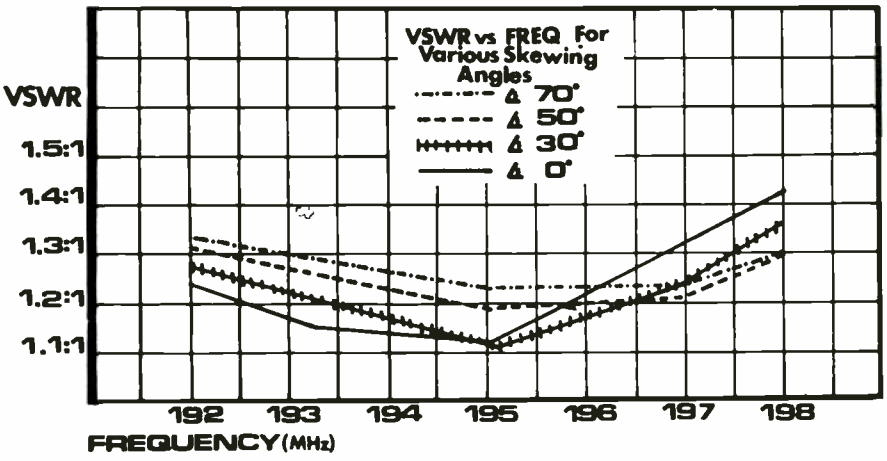
This method is also applicable to arrays given in Figure 6, such as Y-SS-3, 4 and 6 by advancing the lower half of the array according to dimension "W". Add one phasing line to the output of each leading antenna.

Alternatively, on Y-SS-4 and 6 arrays, all antennas in the leading segment of the array may be interconnected and the same done with the lagging array segment. One phasing line would then be added to the leading segments' output before summing the two segments via the final stacking harness. The Y-SS-3 array would require reconfiguration of its stacking harness. This is uneconomical compared to adding the required pair of phasing lines.

Skewing For Greater Azimuth Beamwidth

Low-power transmitting requirements for wide radiation angles can often be best solved through the use of yagi antennas, vertically stacked and physically skewed to

Fig. 12



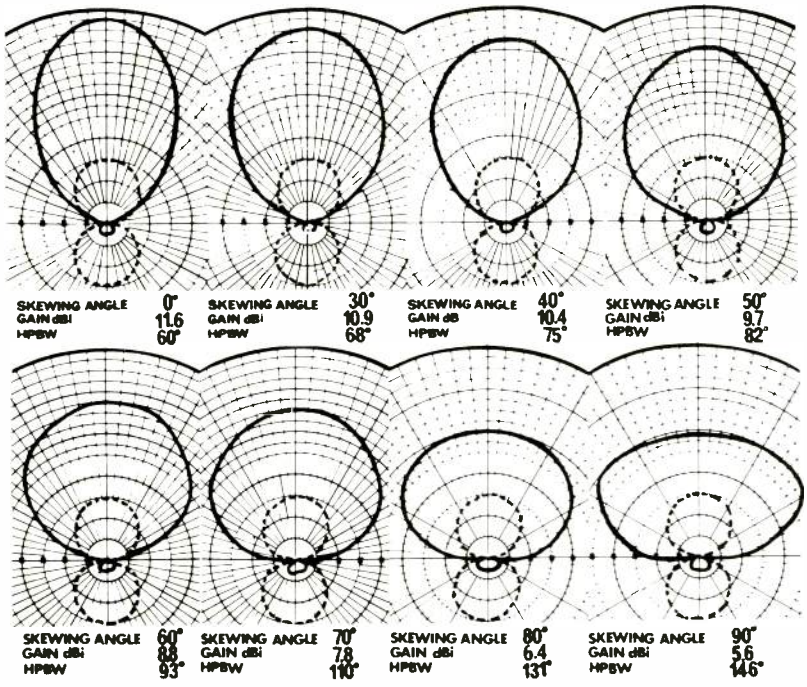


Fig. 13 Results obtained using two 5-element yagis, exhibiting a horizontal (E-plane) HPBW of 60 degrees at 0 degrees skew angle up to 146 degrees HPBW at 90 degrees skew angle.

TABLE 1. DIMENSION "W" BY CHANNEL OR FREQUENCY

CHANNEL OR FREQ.	DIMENSION "W" (in.)	CHANNEL OR FREQ.	DIMENSION "W" (in.)
2	51.75	J	20.12
3	46.75	K	18.75
4	42.75	L	17.62
5	37.25	M	13.12
6	34.75	N	12.25
7	16.75	P	11.37
8	16.15	R	10.0
9	15.62	31	95.31
10	15.15	33	88.0
11	14.75	35	84.25
12	14.25	37	80.0
13	13.87	39	75.75
A	56.75	41	72.0
B	40.0	44	67.12
C	32.0	48	67.5
G	23.25	65	45.37
H	21.5	70	42.25

produce integrated, broad azimuth patterns. The following text and illustrations describe typical results to be expected from skewing. However, there are many variables involved, including the HPBW and gain of various yagis. If you haven't had a great deal of experience in stacking yagi antennas, consult the manufacturer.

Figures 10, 11 and 12 refer to results obtained using two ten-element yagis, exhibiting a horizontal (E-plane) HPBW of 45 degrees at 0 degrees skew angle or up to 130 degrees HBPW at 80 degrees skew angle.

Figure 13 refers to the results obtained using two five-element yagis, exhibiting a horizontal (E-plane) HPBW of 60 degrees at 0 degrees skew angle or up to 146 degrees HPBW at 90 degrees skew angle.

Note that vertical spacing is identical to that of any vertically stacked pair, determined by frequency or channel, and that the two antennas are maintained in-phase by their stacking lines.

It is apparent that, for skew angles above 30 degrees, array gain is significantly reduced, and that for widely skewed antennas, the pattern tends to separate into dual lobes. Gain requirements may then dictate the use of multiple bay arrays. Similar patterns will be obtained but overall gain will increase by about 2.5 dB for an additional pair of skewed yagis. Note, again, that the vertical pattern is narrowed when vertically stacking so that it may be necessary to depress the front of the array for achieving satisfactory close-in coverage. Also note that depressing the array will alter the horizontal pattern slightly, tending to widen it.

Conclusion

These stacking methods have been tried and proven over many years of experience with yagi antennas. However, unsatisfactory performance can occur through no fault of either the equipment or the basic method. If you have any doubt about the results which you wish to obtain, consult the manufacturer. His objective is remarkably like yours . . . the installation of a fully satisfactory antenna array. ▲

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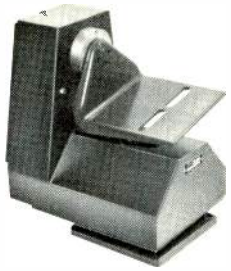
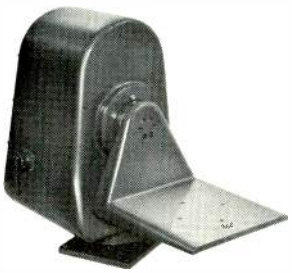


APPLICATIONS	CAMERA LOAD CAPACITY	DRIVE	SPEED	PRESET CAPABILITY	MANUAL CONTROL
CCTV Educational Industrial Medical & Hospital Security, Etc.	30 pounds	AC continuous	TILT 3°/sec. PAN 6°/sec.	YES	YES
For vertical & inverted mounting/preset or manual remote control of pan & tilt functions					

type **230 & 230 SD**



TYPE 230 **CCTV** Outdoor Security & Traffic Surveillance	120 pounds	AC continuous	TILT 4°/sec. PAN 5½°/sec.	NO	YES
For vertical & inverted mounting—completely weatherized					
TYPE 230 SD **CATV** Educational Industrial Medical & Hospital Security, Etc.	100 pounds	AC SERVO	TILT 4°/sec. PAN 5½°/sec.	YES	YES
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type **405**

CATV, CCTV Educational Industrial Medical & Hospital Security, Etc. **BROADCAST** News & Weather Presentations Interviews Panel Shows, Etc.	120 pounds	AC SERVO	TILT 40°/sec. PAN 60°/sec.	YES	YES

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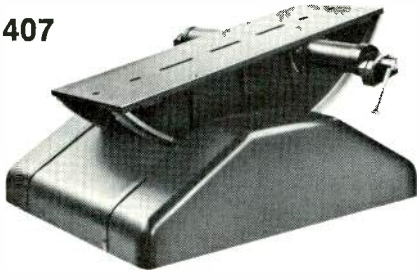

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A Place In The 70's

NAB Convention Notes

Broadcasting's place in the 1970's —that was the theme of this year's national NAB convention. That's a challenge for delegates looking for a friendly port after months of FCC rulings, a suspect economy, the exodus of cigarette ads, and a runaway technology.

But that's not all. Cartoonist Al Capp submitted that if a mob can be inflamed to bomb police stations it can be inflamed to bomb radio and television stations. Even network presidents can be kicked out.

So there will be no doubt about broadcasting's place in the scheme of things NAB president Vince Wasilewski landed these blows in his address to the general assembly:

"Broadcasters recognize that the consumer is entitled to fair and honest advertising. Through the NAB Codes, broadcast advertising is more closely scrutinized and more controlled than the advertising of any other medium. Some products we will not accept at all; on many we place restrictions; on **all** we impose certain standards. And yet the **only** medium that exercises overall cooperative control, and imposes restrictions on its advertisers, bears the brunt of advertising criticism. You see advertising in magazines and newspapers every day that no broadcaster would accept—yet broadcasting, because it is so visible and memorable, gets most of the flak.

"We will meet this attack on advertising head-on.

"First, we will refute the premise that advertising is bad. A fundamental underpinning of the American economy is the ability of advertising to market the country's enormous production. Advertising does not raise the price of goods. Indeed, it lowers prices because it helps to make the economies of mass production possible. That is the message of truth we must get across.

"Second, we must strengthen our own Codes and help others to develop Codes. Our own Codes are several decades old, and they have done a creditable job over those years. They have done a lot more than most people are aware of or believe. But in this modern climate, that simply is not enough. When it comes down to it, there are two alternatives: one, to continue to regulate ourselves even more meaningfully; or, two, accept the inevitable government regulation. The choice is still ours; the answer is obvious. We must support the Codes and delegate to them the power they need.

"Now, let me turn to another area of major concern.

"For 50 years, we have seen various bureaucrats and politicians try to use the licensing power as a weapon to produce the kind of programming and news coverage of which they approve. And they are still at it.

"The FCC recently came forward with an incredible proposal—a group of new requirements which stations would have to satisfy in order to have licenses renewed.

"First: The Commission would prescribe that radio and television stations shall carry certain types of programming in certain percentage amounts and at certain times. Of course, these percentages are described as guidelines and, of course they are not guidelines, they are requirements. And, of course, they would be only the beginning. If adopted, they inevitably will be expanded. The end result will be that the government will inform a station what program it must broadcast, how often, and in what time period.

Public Complaints

"Second: The Commission would require an announcement every eighth day inviting criticism. It proposes to avail itself of your stations in prime time in order to generate complaints against you. Last month, the Commission received a total of 1,822 complaints from the public—approximately 400 of which concerned alleged cruelty to animals during the telecasting of certain rodeos.

"Can you imagine that in a country with 92 million television sets and 336 million radio sets in use in February, a grand total of only 1,822 people complained about broadcasting?

"This every-eighth-day exercise is

NAB President Vince Wasilewski (left) and Neville Miller, two presidents serving during troubled times.

designed to induce more complaints —starting a bureaucratic merry-go-round to insure full employment at the Commission—the whole process fueled with broadcaster dollars extracted from spiraling license and transfer fees.

"Third: **Now** the broadcaster submits his twenty pounds of legal documents, surveys, interviews, program forms, and employment records every three years. Under the proposed regulations, the Commission would require him to submit many of these documents **every** year.

"Fourth: The FCC proposes to rank stations in groupings based on the programming categories of news, public affairs and local programs. Those falling below a certain level, probably the bottom ten percent, will be closely scrutinized at renewal time.

Pleasing The Commission

"But what actually will happen? Stations in the bottom ten percent will be struggling and scrambling to get above the danger line. And how is that done? That is done by conforming closely to what the Commission wants in the way of programming; and, in fact, by exceeding those minimum percentages the Commission has imposed. And as some stations scramble out of the bottom ten percent, others, by definition, fall down into the bottom ten percent—and they in turn will scramble to please the Commission.

"All of these proposals are in one package!

"These proposals—which would produce a jumpy, responsive, subservient broadcasting system, eager to do anything and everything to please the Commission, and intimidated from doing anything that would displease it—are unacceptable.

"We all acknowledge that the Commission must satisfy itself that the licensee is performing substantial service in his community. It must have some tests on which it can base its decisions. What I have described to you is the Commission's attempt to establish those tests. It is a frightening solution."

Belated Recognition For Neville Miller

In the midst of the war that never ceases, the NAB took time out to honor one of their battlefield heroes, Neville Miller. President of the NAB from 1938 to 1944, he was given this year's Distinguished Service Award.

After reviewing the early years of radio, Mr. Miller drew these conclusions:

"The old English theory of the sanctity of property has changed, and property is no longer sacrosanct. Broadcasting, an extremely important factor in the lives of our fellow citizens today, has attracted criticism because of that fact. More and more do we see attempts to dictate to the broadcaster and to control his operation by threats directed at his license. You must not forget you are the licensee and it is your obligation to operate the station in the interest of all the people.

"So long as you continue to render to the public the wonderful unselfish service you have in the past, you will continue to occupy the honored place in the community you now do and have in the past. But when you cease to do that, when you let selfish motives predominate, when you let government or segments of the public tell you what you can or cannot broadcast, then you shall find that there will soon be a reckoning."

"AND IS THIS THE FIRST TIME YOU'VE GONE DOWN WITH YOUR SHIP, CAPTAIN?"

Engineering Award To Benjamin Wolfe

As reported earlier, the NAB presented its annual Engineering Achievement Award to Benjamin Wolfe, vice president for engineering, Post-Newsweek Stations, Washington, D.C.

Wolfe accepted the award and a plaque honoring his achievements at the Broadcast Engineering Conference luncheon.

George W. Bartlett, NAB vice president for engineering, presented the award. He said that Wolfe was being honored for many contributions to communications technology, his "tireless efforts to foster advances in broadcasting, and for his pioneer spirit."

In accepting the award, Wolfe said he has thoroughly enjoyed his 35 years in broadcasting and feels privileged to be a part of an industry that has produced the "greatest free system for radio and television broadcasting in the world."

Charles F. Abel, KFMB-TV, San Diego, Calif., Chairman of the Engineering Conference Committee, presided at the luncheon.

From our point of view, Ben Wolfe certainly has given his share plus. And he is an opinion leader (pioneer) partly because he had the courage and conviction to stand before the industry on many occasions and state his position. While this magazine doesn't give awards, it does operate as a forum where recognition can be given.

Ben Wolfe should serve as a reminder to us all that if engineering is to move upward, it must, with humility, stand up and be counted.

Education's Challenge

There were quite a few students in attendance, but few were student engineers. And the National Association of Educational Broadcasters president was seen taking the full tour.

But it was John Macy, president of the Corporation for Public Broadcasting, who surfaced with the educational banner. As so many educational broadcasting (or public

broadcasting) have done before, Macy redefined the objectives, problems and financing of educational broadcasting.

"We in public broadcasting need," Macy said, "more of your discipline, skill and professionalism, and in turn, I think we offer to you an ideal broadcast laboratory by virtue of our greater freedom to innovate."

In summing up Macy said, "It almost goes without saying that we share common problems—of how best to utilize the emerging new communications technologies, of program standards and of balance and fairness. I think we serve neither ourselves nor our audience if we re-invent each other's wheels. At the outset, I suggested we would rise or fall together. Let us now start a new ascent."

Astronaut Shepard

Capt. Alan Shepard spoke at the opening general assembly where he was honored for his "skill, courage and dedication," and presented with a crystal sculpture depicting an astronaut on the lunar surface.

The presentation was made by NAB Board Chairman Willard E. Walbridge, senior vice president in charge of corporate affairs, Capital Cities Broadcasting Corp., Houston, Tex.

Capt. Shepard said past manned flights to the moon prove that they are the best return on the tax dollar.

The Apollo 14 commander said the rocks brought back to earth may hold the secret of the solar system and the country should look ahead and not back.

He said we will have to go back for colonization and observation and said he is "optimistic that the American people will charge ahead in the manned space program."

Capt. Shepard was making a 10th anniversary appearance. He was the first American in space in 1961 and appeared with President Kennedy at NAB's Convention that year in Washington just after riding a Freedom 7 capsule in sub-orbital flight.

New Rural Society

A communications expert warned the nation's broadcasters that America's corporations and state and local governments are shortchanging themselves and the people they serve by not taking advantage of already existing communcations

Dr. Peter C. Goldmark, President of CBS Laboratories, a division of Columbia Broadcasting System, Inc., said that by continuing to concentrate their facilities in urban and suburban areas businesses and governmental agencies are unwittingly compounding the pollution, crime, drug addiction, and increasingly intolerable living conditions.

Dr. Goldmark, who invented the long-playing record, pioneered color television, and spearheaded the development of electronic video recording, was the luncheon speaker at the Broadcast Engineering Conference being held here as part of the 49th annual convention of the National Association of Broadcasters.

Dr. Goldmark said the nation's resource—land—is not being utilized to alleviate the catastrophic increase of crime, pollution and social ills in the cities. He pointed out that more than 90 percent of the population is concentrated on less than ten percent of the land in America. Unless this trend is reversed, he said, the survival of our national life will be seriously jeopardized before the end of this decade.

Report From Sessions

Future Satellite communications and such down-to-earth problems as the impact of cable television and the dangers of broadcast regulation were discussed at a session of the Association for Professional Broadcasting Education.

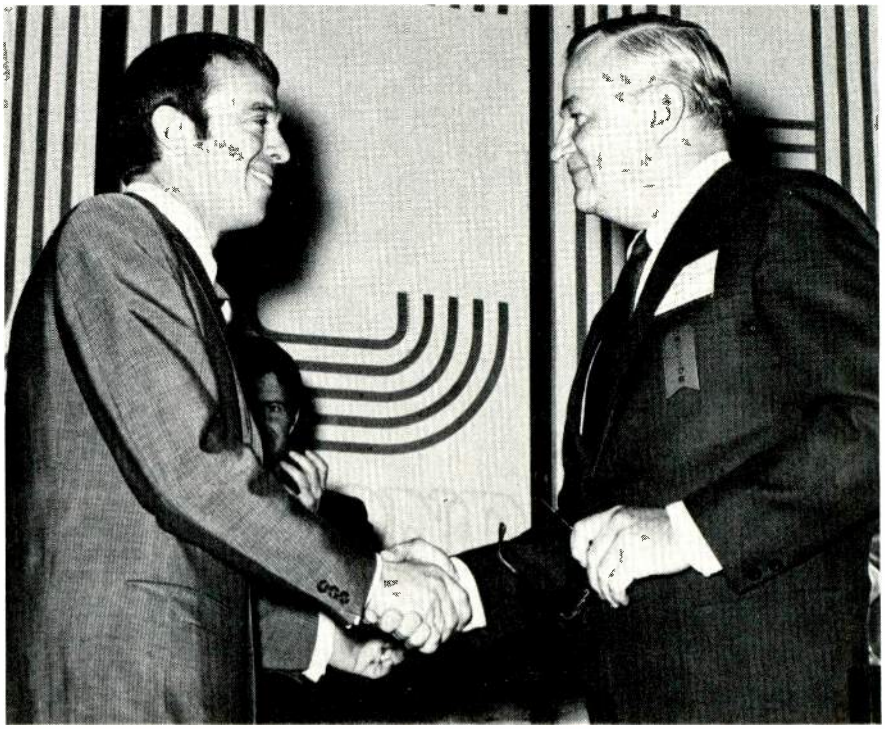
Participating in the panel on "Broadcasting, 1975, and Beyond" were Eldon Campbell, vice president, WFBM Stations, Indianapolis, Ind.; Donald Taverner, president, National Cable Television Association; Joel Rosenbloom, of the law firm Wilmer, Cutler & Pickering, and Al Horley, Director of Telecommunications, Department of Health, Education and Welfare. The session was moderated by Jack Lee, Lin Broadcasting Corp., New York, N.Y.

APBE's 17th Annual meeting was held in conjunction with the 49th Annual Convention of the National Association of Broadcasters.

Campbell said the problems of broadcasting will never be solved by harassment and government regulation.

Public Interest Profit

He said that when broadcasting demonstrates its social conscience and goes to bat for the public interest it often makes a profit. "When business profits," he said, "it becomes the victim of a new onslaught of regulation, ridicule and regimentation. This makes a mockery out of privately-supported public gov-



Shepard being congratulated by NAB's Walbridge. The astronaut said moonflights are a good return on tax dollars.

ernment and privately supported public airways." He told the broadcast educators that there must be rules of conduct for broadcasters that afford them "equal opportunity to the market place of commerce, ideas, resources, copyright and talent."

He said that stations are so bogged down with FCC reports, questionnaires and paper work that they lose valuable time that should be spent fulfilling their public interest obligations.

Taverner, in discussing cable television, termed it "the most under-regulated, over-regulated and mis-regulated of all industries."

Cable broadcasters, he said, merely want to expand the broadcasting experience. Proper development and regulation of the industry in the public interest, he said, depends on the influx of capital from the private sector.

He added that cable television can serve a need at the local level by being involved in community problems.

The NCTA president explained that cable-TV will never seek the mass audience because the commercial broadcasting industry would never allow it to happen. Cable television, he said, will not take over broadcasting as we now know it—it will strengthen the industry.

Mr. Horley said his office at HEW is hoping to develop satellite broadcasting so it can serve isolated individuals, such as migrant workers, and isolated communities. Satellites can bring together large, dispersed groups, he said, such as professional societies, the handicapped, and minority groups by providing a powerful centralized service.

Mr. Rosenbloom, who once served as legal assistant to former FCC Commissioner Newton Minow, said he foresees even more government regulation in 1975. This may happen, he explained, because liberals and conservatives share one common belief—that broadcasting should be regulated.

TV Standards

Use of Standards of the Society of Motion Picture and Television Engineers by television stations can ensure identical TV pictures from motion picture films or video tapes.

W. T. Wintringham, of New York, SMPTE's engineering vice president, told delegates to the 25th annual Broadcast Engineering Conference that for the last 21 years, SMPTE has had responsibility for the preparation of Standards and Recommended Practices covering the production of video signals from motion picture film and video tape.

Wintringham said the Society sponsors four American National Standards and eight Recommended Practices covering details of the use of motion-picture film in television.

To aid in the application of these Standards and Practices in the adjustment and evaluation of television film-chains, he said, the Society has test material available in the form of 35mm and 16mm motion picture film; in the form of 8 x 10 inch transparencies, and in the form of 2 x 2 inch slides.

He said the Society is now working on the development of similar test materials for video tapes.

To help insure interchangeability of program material in recorded form, the Society's specifications on video tapes cover such matters as the dimensions of the raw tape, of the reels, the splices, and of the vacuum guides in video tape machines. Other standards cover tape speed, modulation practices for low-band monochrome and color recordings, and the characteristics of the audio record, he said.

Wintringham said the acceptability of a color picture depends on the conditions under which it is viewed. To insure that different station engineers see the same picture, he said, SMPTE has issued a Recommended Practice calling for a reference white on studio monitors corresponding to CIE Illuminant D6500.

"This leads directly to the problems of standardization of color motion picture film for use in broadcasting," Wintringham observed. "In this case," he continued, "interchangeability is affected greatly by the fact that film is produced in motion picture rather than in television studios . . ."

Windshield FM Wipe

The Delco Electronics Division of General Motors Corp. reported that extensive tests with its automobile antennas has led to improvements in FM reception, culminating in the use of the windshield antenna.

The problems of handling rapid variations in FM signals under all conditions of a vehicle's location and speed are being solved, broadcast engineers were told by H. G. Riggs, general manager, Delco Electronics Division, General Motors Corp.

Riggs addressed a group of engineers attending the Broadcast Engineering Conference, which had been held here in conjunction with the 49th annual Convention of the National Association of Broadcasters.

In introductory remarks, E. H. Herlihy, director of engineering, Kaiser Broadcasting Corp., outlined industry efforts to improve FM car radio reception in General Motors cars using windshield antennas.

He said a joint Kaiser/NAB engineering study began in February, 1970, made tests on directivity, impedance and resonance of the windshield antenna. In addition, he said, an indepedent engineering study by Carl Smith Associates of Cleveland and presented to Delco showed about the same findings as the Kaiser/NAB study.

Riggs said that a problem with car radio reception is interference from surrounding geographical areas. Listeners receive noise bursts in rapid succession as they drive along, and these noise bursts are due to a major automotive FM reception problem: multipath distortion.

Audio-Video Check-Out System

ABC described to broadcast engineers an audio and video routine test system which it said cuts conventional time for checking the performance of audio and video circuits within a broadcast plant.

Hans Schmid, ABC senior engineer, told delegates to the Broadcast Engineering Conference that a new system installed last year at ABC's New York Central Switching Control eliminates the usual multitude of test signal generators and measuring equipment which must be carried around and connected.

The routine audio and video test system employs automatic generators and receivers. Mr. Schmid said the equipment is composed of: an audio routine test signal generator which features the complete absence of operational controls and metering. It has two isolated out-

(Continued on page 54)

TELEVISION ELECTION

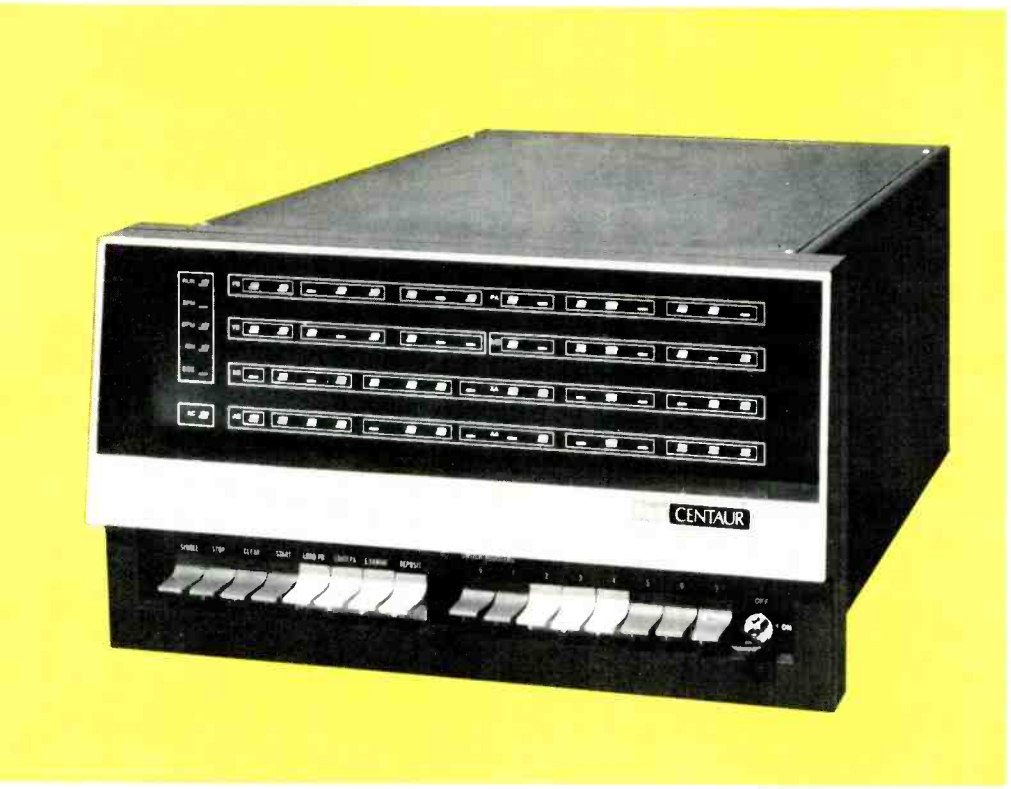


Fig. 1 The Foto-Mem Centaur mini-computer . . . at the heart of the WTIC election system.

*By Harold A. Dorschug**

To cover the 1970 Connecticut elections, WTIC-TV achieved very outstanding results with several of the most modern display systems. These systems consisted of a computer-controlled character generator programmed to display 19 races and a board comprising "split-flap" graphic numerals arranged in an 8-race conformation. These were used in conjunction with a batch business computer to obtain additional features such as high-speed hard copy print-out required by the staff of WTIC AM-FM.

Editor's Note: The WTIC election coverage described here has been awarded a Special Citation in the Election category of UPI's 15th annual Tom Phillips Awards.

*Director of Engineering, WTIC-TV, Hartford, Conn.

Planning for this operation started early in the year. Regular meetings of the group responsible for the project consisting of representatives of program, production, news, engineering and business were held. The services of Mario W. Conti, consultant from Manhasset, New York, were also available to the group.

It was decided that the primary display system would utilize the station's Videograph Character Generator and the secondary display would involve split-flap units. The reasoning behind this decision was based upon the speed with which the character generator could flash results on the screen when computer driven. Since only one race could be shown at a time (because only the bottom of the TV screen was to be used) instant call up from the memory bank was necessary.

The split-flap units, on the other hand, operate more slowly but retain their settings until updated and show all race results simultaneouly. These factors meant the electronic characters would be used during the actual vote gathering, a hectic period of about one hour, and the large display board would be used for final vote tally during local program periods throughout the remainder of the evening. For this purpose the WTIC boards harmonized well with the CBS network displays with which their appearances were intermixed.

During the early period, these displays would be updated continu-

REPORTING SYSTEM

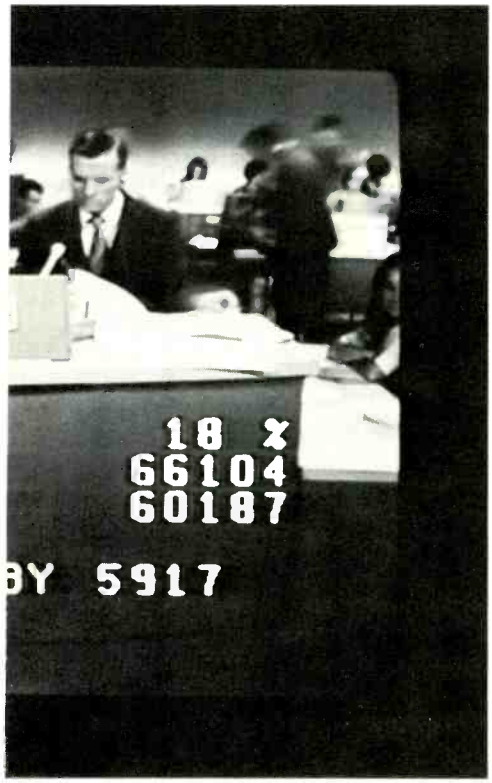


Fig. 2 Monitor display showing results of the race for Governor.

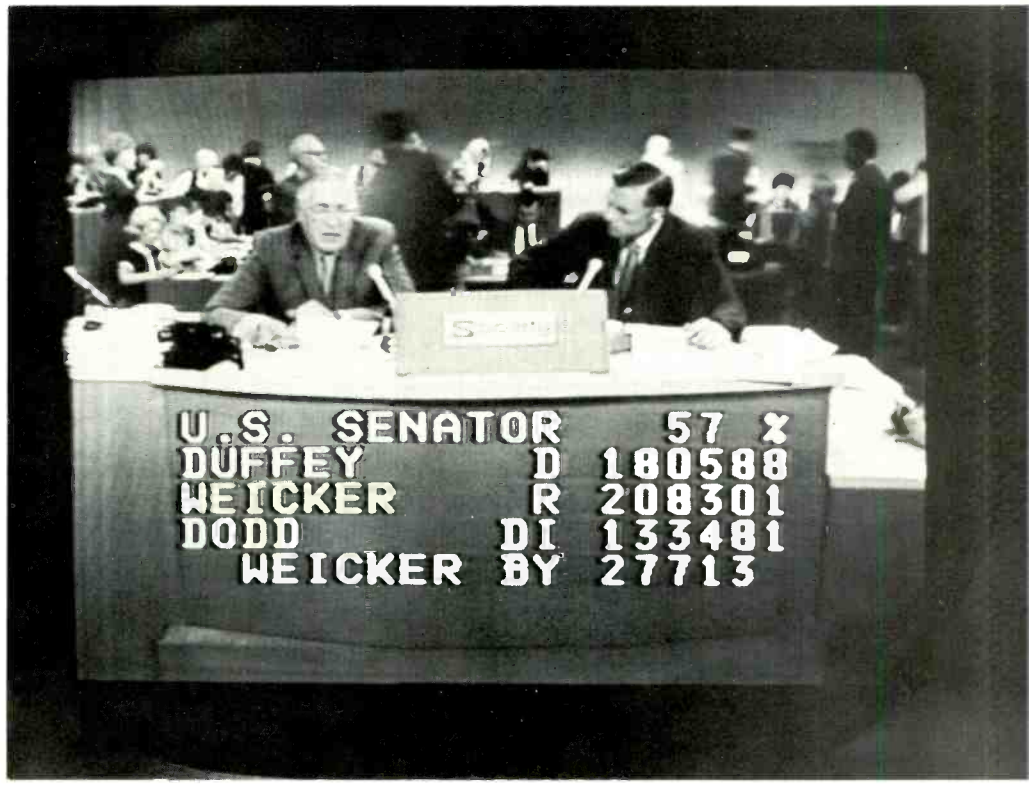


Fig. 3 Monitor displays results of voting on three candidates and spots the winner in the Senatorial contest.

ously and would provide a backup, if necessary, for the electronic system.

Computer Package

An order was placed with Foto-Mem, Inc. of Natick, Massachusetts for one of their Centaur mini-computors complete with an additional memory disc and teletypewriter terminals. A complete soft-ware program was also part of the package. H. Malcolm Wilkinson, General Manager, Computer Science Division of Foto-Mem, directed the project including interfacing with WTIC's Videograph Generator.

The system was arranged so that input data were punched into standard teletypewriter tapes which were read into the computer by a standard tape reader. Command over the output and control of the character generator was by means of a teletypewriter. Figure 1 shows the Centaur computer.

The format of the election displays are shown in Figures 2 and 3. In general, they contained the title of the race, percentage of votes tabulated, up to 3 candidates' names, party affiliation, the current vote for each, plus the name of the leader and his plurality. As you can see, the studio set behind the commentators was arranged with the lower half blank and of a suitable color to produce a panel in which the message could be keyed. Edge enhancement with an Anderson Labs BORDERLINE was very effective.

In Connecticut, at the present time, voting is done in 648 polling places. Each was staffed with a reporter who telephoned his results to WTIC as soon as they were available. Consequently, results were based on the actual "raw" vote. Since the 648 polling places are distributed among 169 towns and traditionally the results have been reported from each town as its vote is complete, there was much discussion over reporting towns versus polling places. It was decided that to wait for complete town reports before showing results would slow down the process and the decision to stay with the raw vote is what kept us ahead.

It was, however, felt desirable to present the 169 town votes because of audience interest. The computer was programmed to generate a "roll" containing a format of the leaders in each of the two main

races, governor and U.S. senator, with the vote. It was planned to use this after statewide results were known but as it turned out, it was delayed too long to be useful (through no fault of the program). This was a most elective presentation which would be impossible without employment of the computer.

The split-flap board is shown in Figure 4. A number of these digital display devices are available on the market. The Mischiatti brand was chosen because it offers several advantages. First, it contains alphanumeric characters and matching units with blank panels of various lengths are also available. Also, the displays are fast and quiet.

After election, other uses were planned, involving letters such as weather reports, sports and similar features. They operate on a 6-bit digital code which makes them a natural for computer control of interfacing with various computer technology devices.

Using this fact, Mario Conti designed and produced a solid-state control system which anticipates computer operation. This system also resulted in a great reduction and simplification of the inter-connecting cables, providing great flexibility and expanding the combinations of displays available. The units were operated by means of "thumbwheels" arranged in three groups consisting of a master and two or more slave units. The groups were stacked the same as the display board configuration to simplify data entry. Figure 5 shows this operating position.

Figure 6 is a flow diagram showing how votes were processed from their arrival by telephone to on-the-air pictures. A partial view of the studio portion of the operation is shown in Figure 7. It required less than four minutes for a telephoned report to be included in the "on-air" display total. A significant part of this time was caused by the fact that the cards had to be carried from the IBM card punches in the first-floor studio to the card reader in the Honeywell computer room on the third floor. However, a pre-election rehearsal revealed that the system as shown was capable of updating the character generator displays faster than the commentators could use them. Consequently during the actual broadcast, Honeywell print-outs were inhibited somewhat to pace the use.

A print-out about every four minutes was adequate. This, of course, would be determined by the number of races involved. Although the computer stored formats for 19 races, only 11 were in continuous use and the remainder were called up only when final votes were available. Fewer races would require a faster print-out. When the vote percentage reached 100 percent, the name of the winner blinked automatically.

While any television station owning a character generator could use it in the manner of WTIC-TV, certain distinct advantages would be lacking without the computer. These are its large memory, instant recall, the ability to accept and process input data in simplified form, and the fact that it will perform arithmetical functions while doing the other things.

Once the program has been written and formats created, the information is prepared according to code, entered and called out. It will do this in random sequence, of course, and if two terminals are employed, both input and output terminals will function at the same time.

Fig. 4 Studio set containing Mischiatti display units. The title of the display and the names of the candidates were part of the overlay.

Fig. 5 Secretaries operating the Mischiatti control units. Each of the triplicate controls will operate any one of the displays.

Computer Input

Our input code consisted of a "read" instruction (R), a 2-digit address (01), percentage of vote tabulated (001), followed by the vote of each candidate filled out to six digits by dots (. . . 123, . . . 456). Because the Honeywell was doing the basic arithmetic as part of an elaborate analysis, we also chose to enter the name of the leader together with his margin. However, future programs will be written for

Yes, YOU can reduce your risks of heart attack

While scientists are searching for cures, *everyone* can take these simple precautions: see your doctor periodically; reduce if overweight; eat foods low in saturated fat and cholesterol; stop smoking cigarettes; control high blood pressure, and exercise regularly.

You also reduce your risk when you give to the Heart Fund to support your Heart Association's program of research, education and community service.

GIVE...so more will live
HEART FUND

Contributed by the Publisher

the Centaur to do this arithmetic and select the leader, automatically. The verifying copy of the girls who punched the tapes for Figure 2 read as follows on the teletypewriter:

R07
.18
.66104
.60187
DADDAR10.by.5917

Use of "LINE FEED" key after each line entry performed all necessary functions for the computer to enter these data in the correct portion of the format. Choice of the race to be displayed was made by a similar code using the letter C followed by the address. This would be "C07" for this illustration. Instant execution occurred when the last digit key was depressed. This was handled by a television director who coordinated call-ups with the news director.

System Update

Looking ahead, several modifications to the system are planned. Certainly the Mischiatti units should be connected directly to the Centaur. This will eliminate one point of potential error. Another will be to use cathode ray tube terminals (CRT's) for data input. These devices, offered under the name Foto-Vision by the manufacturer of the Centaur computer, are also available from other sources and widely used in the data processing field for rapid and accurate input and output use.

Appropriate programming, for example, would present the format for the data being entered to the CRT operator and remove some of the mystery of the simplified codes associated with punched tapes. Instant verification of the material would also be possible in somewhat easier fashion than the printer provides. Finally, consideration will be given to the possibility of interfacing the Centaur with the Honeywell. Such a connection would allow continuous input transfer to the Centaur and could result in benefits due to the larger capacity of the Honeywell, including its magnetic tape drives and other peripheral devices.

Elections over, the Centaur was configured for numerous day-to-day uses in news, sports and general programming. Automatic and instant preview of these formats on the Foto-Vision terminal prior to airing will be of great value.

WTIC-TV has realized some of the benefits available from the use of computerized election reporting. The many favorable comments from the audience together with the satisfaction of management are providing the encouragement to move even further ahead to this area.

Fig. 6 WTIC election information flow diagram.

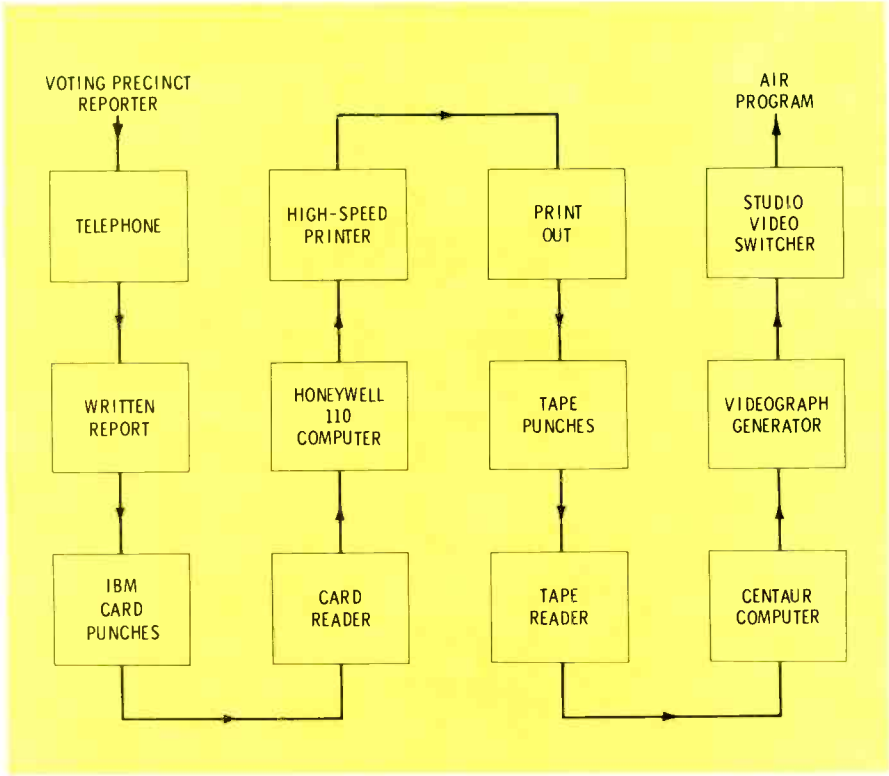
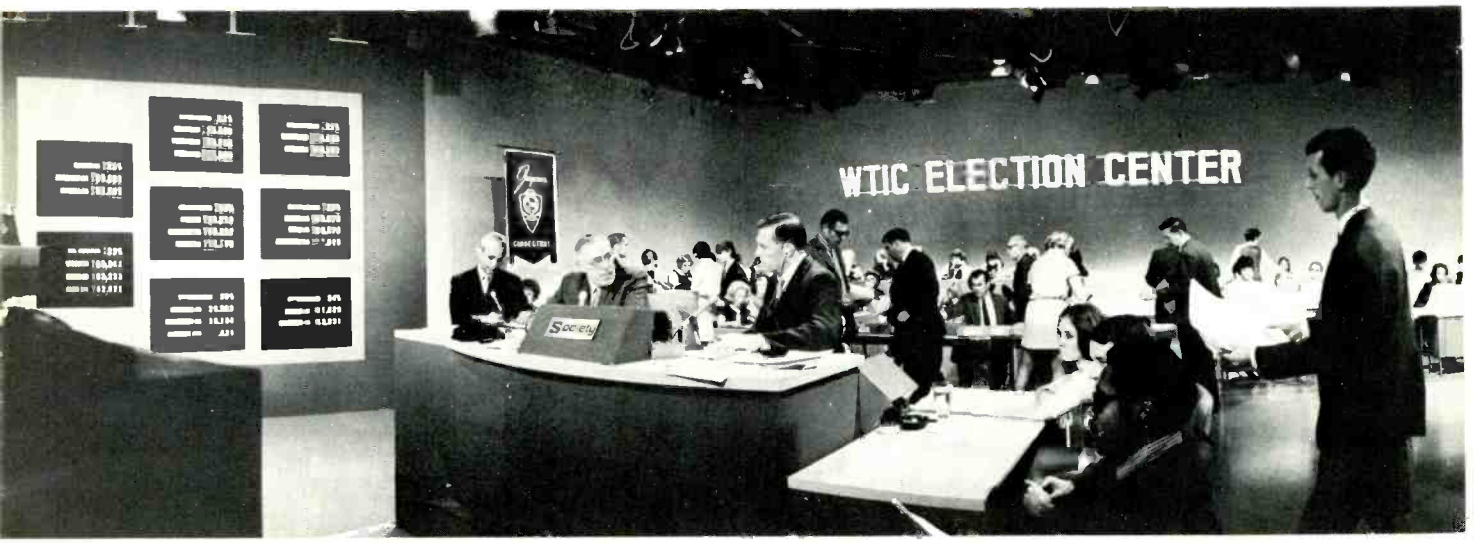


Fig. 7 Overall view of the studio used as Election Center. Votes were also collected and tabulated here.



Cable Assist For Fire Truck

What happens when a firetruck runs out of gas on its way to a fire?

When a disastrous fire struck a private preparatory school in Great Barrington, Mass., a tank truck from one of the nine responding fire departments ran out of gas right in front of the office of High Fidelity Cable Television. However, the cable company promptly supplied gas from its own gas pump and sped the tanker on its way.

Later that night, after the flames had been brought under control, the firemen relaxed in the Great Barrington fire station and watched a videotaped replay of the fire on High Fidelity's Channel 2 news program.

And the next day cable subscribers in nearby Pittsfield saw the same tapes, supplied by High Fidelity to Pittsfield-Dalton TV Cable.

AEL Offers CATV Technical Paper

AEL Communications Corp. offers its latest publications in cable TV.

The first is "CATV, a Brief Exposure to its Technical Requirements" by Samuel H. Colodny, Chief Engineer of AEL Communications Corp. The other publication details the system performance specification and proof of performance procedure (for the 50-270 MHz range) as produced by AEL Communications Corp.

AEL Communications Corp. has developed such items as ASG (Automatic Slope & Gain Control) —to avoid temperature differential interference, the SUPERBAND(R) line of amplifiers and the SUPERBAND(R) tunerless CONVERTER.

EAN ERROR

NIAC EBS Survey

An Ad Hoc Working Group of the National Industry Advisory Committee (NIAC) was formed by the Defense Commissioner, Federal Communications Commission on February 25, 1971 for the purpose of analyzing the responses and reactions of the broadcast industry concerning the Emergency Action Notification (EAN) transmitted in error on February 20, 1971 and its effect on the Emergency Broadcast System plans and procedures.

The analysis of questionnaires by stations in response to the Defense Commissioner's February 22, 1971 request reveals a pattern of reactions which, taken together, prevented the spurious teletype message from triggering the complete nationwide system at all levels.

All 6249 respondents were asked if they knew what they were supposed to do; only 233 stations—3.7% of the total—stated they did not know what to do on receipt of the Emergency Action Notification.

Reasons For No Action

Stations cited a number of reasons for taking no action.

In reply to the question: "What action did you take —if you took no action, give your reasons," the following were the most commonly cited reasons: Totals exceed 100% due to multiple answers.

1) Received no confirmation of EAN through monitoring of assigned Key Station (36.8%).
2) Received message on AP or UPI Radio Wire advising that EAN was sent in error (30.8%).
3) Doubted validity of EAN message (28.0%).
4) Coincided with time of regularly scheduled test message (20.8%).
5) AP-UPI message not seen until after cancellation (14.0%).
6) Network affiliates monitored National Programming channels, heard normal programming since Network EBS not activated (13.0%).

Reasons For Not Acting

Coincided with routine test	1188	(20.76%)
Validity questioned	1604	(28.03%)
EAN cancelled	1763	(30.81%)
Did not know what to do	233	(4.07%)
Equipment failure	222	(3.86%)
EAN not noticed	808	(14.07%)
No announcements on networks	745	(13.02%)
No action by Primary Stations	2108	(36.84%)
Not on air	498	(8.70%)
EAN not received	815	(14.24%)
Teletype out of service	116	(2.02%)
No response to question	152	(2.65%)

Recommendations

None	3180	(50.34%)
Simplified instructions	272	(4.30%)
Simplified system	489	(7.74%)
Random AP/UPI tests	678	(10.73%)
Move Seize Key to White House	73	(1.15%)
Conduct State Wide Tests	22	(0.35%)
Fail safe system	552	(8.73%)
Alarm in Control Room	565	(8.94%)
New System	879	(13.91%)

(Continued from page 45)

metering. It has two isolated outputs. the PGM output and the MON output.

An audio routine test receiver, which contains the monitor amplifier, automatic VU meter, automatic harmonic distortion meter and automatic signal/noise ratio meter works automatically, using only the information contained in the routine test signal itself. In just 15 seconds, an observer can check level, frequency response, harmonic distortion and S/N ration without touching the equipment.

An automatic VU meter, which provides an amplifier for the VU meter ballistics. The meter range is indicated by pilot lights which indicate either an 8 VU or 18 VU range.

An automatic harmonic distortion meter. This unit derives its signal from a buffer amplifier in the VU meter unit. It will indicate any malfunction of a circuit that had initially been "acceptance-tested."

An automatic signal/noise ratio meter, which derives its signal from the buffer amplifier in the VU meter unit. A sensor circuit senses a level of –30 dBm or less during step twelve of the routine test signal and actuates a relay that connects the meter circuit to the signal.

Schmid said the video routine test signal generator's standard feature is the external selection of various signal outputs.

The video routine test receiver, he said, is an assembly of available equipment and includes the picture monitor, waveform monitor, and vectorscope. At the moment, he said, the equipment cannot be externally programmed for different modes of measurements such as switching the vectorscope from vector mode to differential phase mode and each mode must be selected manually. Two cycles of the video routine test signal are required to cover the whole range of measurements. But Mr. Schmid said a new test signal generator with an automatic system will be available in the near future.

Computerized Lighting

Broadcast engineers were told that the CBS-TV AutoCue computerized lighting control system "is a powerful tool in providing immediate access to a large number of functional actions" and provides flexibility in data manipulation through its stored program computer.

The AutoCue system uses a computer alphanumeric display to convey system status to the operator and a light pen as its main instrument of control.

The CBS system was described by Salvatore J. Bonsignore, staff lighting consultant, CBS-TV, New York, N.Y. Adrian B. Ettlinger of CBS co-authored the presentation.

Remote Monitoring

A sensing device which detects reduction in signal level and can actuate an alarm monitors unattended NBC remote equipment supplying audio and video signals.

Sherman Atwood, manager of NBC broadcast systems engineering, made his remarks to a group of broadcast engineers attending the 25th Annual Broadcast Engineering Conference.

The sensing equipment, he said, automatically monitors from Radio City NBC's incoming lines from its facilities at Englewood Cliffs, N.J.

Atwood said the test signals used for evaluation of the sensor are 1,000 Hz sine wave for audio and standard composite color bars for video.

"Tests showed that with proper level of these test signals and the threshold level set for 2 dB below normal level, there were no false alarms," he told the conference delegates. "Further tests indicated that sensitivity and repeatability appeared to be such that we could count on a half dB level change to actuate the alarm. This assumes no change of signal content."

The entire apparatus, he said, consists of four sensing devices mounted on a 5¼ inch rack panel, together with an audible alarm, four pushbuttons to test each of the four sensors, necessary signal attenuators, and an on-off switch.

Atwood said no provision was made to indicate which of the four circuits was in trouble when the alarm sounds. The alarm, he said, merely indicates that a problem exists on the remote circuits, and there are adequate conventional means of immediately determining the quality of both audio and video signals.

Dean Burch Reviews The Issues

It was most appropriate that the FCC's Dean Burch should address the convention on some of the most bewildering points confronting the broadcasters today.

Rather than take the old stance of holding major issues at bay and talking mostly in platitudes, Burch covered several areas briefly, and then settled down to putting the Fairness issue into perspective.

Because of the importance of his message, we are presenting here a major portion of what he said as he said it. You will read it just as the delegates heard it.

"Somehow, there's a subtle balance that has to be struck between smug super-cautiousness and a naive, and ultimately self-defeating adventurism. It comes down to a recognition that the public interest will be served only if established institutions like broadcasting are constantly being reformed and constantly improved. But at the same time the foundations have to be preserved—else there won't be anything left to improve, and nothing left to do the serving.

"First, I want to touch briefly on two matters that are high on the agenda—refinements in the renewal process, and the future of CATV. But then I'll devote the burden of my remarks to one of those all-encompassing issues that force us back to first principles—to raise questions about broadcasting as we've known it **and** about some disturbing trends that have to be faced and, hopefully, resolved. That issue is the recent evolution of the fairness doctrine.

"On the renewal process, I think the Commission has major improvements under way. Although it's fruitless to seek anything like mathematical precision in defining what is meant by "substantial service", it's just as certain that neither you nor the public should be left wholly without guidelines. However tempting, it's also self-defeating to say "this is too tough a problem, so let's do nothing".

"There **are** bedrock principles involved here . . . that the licensee must cultivate deep roots in the community, that his programming must relate to community concerns,

and that he must seek to achieve a reasonable balance in his treatment of controversial issues, across a wide spectrum of community interests. With your help, and with the public looking over our shoulders, it seems to me that we ought to be able to delineate useful guidelines.

"Our proposals on the renewal process aim, first, to facilitate public participation in the entire broadcast operation. And, on the other hand, we want to inhibit last-minute harassment of the renewal applicant . . . to make him less vulnerable **not** to reasonable and constructive criticism but rather to deadline pressures that are so unreasonable as to approach blackmail.

"Moving on . . . we've reached the threshold of further action in the CATV area. The comments are all in. We've just concluded ten days of oral arguments. And while we hope to reach some decisions in the next few months . . . about importation of distant signals copyright, technical standards and channel capacity, and the locus of regulatory authority, to name a few . . . you'll appreciate that I'm simply not in position to give you definitive answers.

"I can only reiterate the Commission's objective . . . to integrate CATV into the nation's communications system in a fair and orderly way. And "fair" is indeed the nub of the problem. We're not in business to guarantee the broadcaster an easy ride and an automatic profit. And by the same token we're not in business to hurt him or throw roadblocks in his way. We're out to serve the public interest in **all** its dimensions. And that is how this CATV issue is going to be decided. Our final decisions will probably please no one perfectly . . . and maybe that's the way it has to be.

Fairness Doctrine

"Now, I propose that we lay aside the regular agenda and zero in on the fairness doctrine . . . how it originated, how it evolved, and where it seems to be taking us. And I propose that we begin at the beginning . . . indeed, with the origins of this entire broadcasting enterprise.

"I said earlier that you were a captive audience. But, in a real sense, we **all** are captives . . . because all of us live with the consequences of decisions that were made nearly half a century ago. Back in its infancy, it became apparent that broadcasting was not some sort of a toy: it was a common resource of immense potential, and a scarce resource as well.

"From the start, the locus of judgment **and** of responsibility was to be the independent commercial entrepreneur. And he was to operate **not** as a common carrier, with his facilities available to any bidder, nor as just a profit-maker, with his facilities available to the **highest** bidder.

"The broadcast license was in effect a public proxy . . . a temporary and revocable monopoly over a scarce public resource, in return for service in the public interest. In recent years, the FCC explicitly affirmed that a lion's share of spectrum space was allocated to commercial broadcasting precisely **because** of its ability to help create an informed body politic on issues of overriding public importance. What the Supreme Court has since described as "the promotion of robust, wide-open debate" is not just some "time available" side-line. It is an always has been **central** to the

purposes of commercial broadcasting.

"Between the Mayflower case of 1940 . . . in which the FCC barred the broadcaster from open expression of his own opinions . . . and the 1949 Report on Editorializing, the fairness doctrine was given a new twist. It was no longer enough for the broadcaster simply to avoid **denying** anyone the right to discuss controversial issues. He had the positive ogligation to **promote** balanced consideration of such issues. Thus, if he presented only one side, the licensee could not simply sit back and wait for the other side to knock on his door. It was up to him to seek out the other side and implement its presentation.

"The Commission put a special gloss on the fairness doctrine in its personal attack requirements. When such an attack is made, in the course of a discussion of controversial issues, the licensee has the duty to advise the target of the attack, and to offer a reasonable opportunity for response. Again, what is involved is not so much the right of the person attacked to **respond** but rather the right of the public to **hear** a response, and to hear it from the person best able to know the facts. And in the Cullman case, the Commission ruled that the response to an attack, or in other fairness areas, must be put on free if the station could neither secure payment for it nor find a sponsor.

"Both the personal attack requirements and the fairness doctrine itself were of course sustained by the Supreme Court in Red Lion . . . authorized by statute and fully consistent with the First Amendment. In Mr. Justice White's words:

> 'It does not violate the First Amendment to treat licensees, given the privilege of using scarce radio frequencies, as proxies for the entire community . . . obligated to give suitable time and attention to matters of great public concern.'

"The evolution of the fairness doctrine has been dynamic . . . and the pace is speeding up. In a real sense, your industry is the victim of its own success. It's a vital medium. The public wants "in". And a growing crowd of individuals and groups are **demanding** access. Then, too, broadcasting has helped to **create** the problems it is inheriting. Issues that once would have been worked out in the fullness of time, and with the participation of a very limited public, now tend to get broadcast and televised **immediately** onto the agenda. Time and space are compressed. And a sense of public awareness has been enormously heightened. Broadcasting and its impact have themselves become issues.

"Thus, since Red Lion, the Commission has contended with new variations on the classic concept of fairness. In the cigarette ruling, it held that stations would have to balance paid cigarette commercials with a reasonable amount of anti-smoking views . . . partly as a matter of fairness but basically in the public interest. And this in turn opened the question of whether other product advertising can and should give rise to the same kind of fairness obligation.

"I believe I've said enough to indicate where it is we seem to be heading. The era of **consumerism** and even of **participatory democracy** is colliding head on with the broadcasting industry . . . and it threatens to be a rough and perilous road ahead.

"The problems we're beset with all involve the demand for access. They involve the demand for time, and often free time, by groups that see themselves as ombudsmen of the public interest . . . voices that simply must be heard. They involve the substance of advertising, meaning that "the Dodge rebellion" and "the man who wears the star" are themselves issues of controversy.

"I'm asking, in effect, at what point does access choke off the channels altogether? As the burdens are piled on, when do we break the industry's back? Does the broadcaster exercise balanced judgment . . . or does he just compile each day's agenda for public debate, in narrower and narrower segments as the petitioners line up? Would this be **broadcasting** . . . which, imperfections and all, probably gives the public about what it wants and deserves? Or would we end up with one dead goose and a shrinking supply of eggs, golden or otherwise?

NEW PRODUCTS

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

NAB Product Roundup

In the March Pre-NAB issue of BE we covered a long list of new products to be introduced at the Chicago convention. After making the long trek through the exhibit areas at the convention, we found quite a few more new products.

It was obvious from the outset that everyone wants a piece of the automation pie. It was also apparent that most exhibits got the kind of traffic they wanted. Business was good.

So out of the more than 140 exhibitors have come more than BE could hope to cover in a pre-convention or convention coverage issue. We will continue to show the latest innovations in the June issue. And if you want to see what some of this new equipment looks like, pay particular attention to the BE ad pages in this and upcoming issues.

Film, Tape Editing

CBS and **Memorex,** through their CMX Systems joint venture, announced a breakthrough that allows either video tape or film to be edited electronically with equal ease and at a level of artistic flexibility.

Called CMX 600, the new instant image access system also automatically assembles broadcast-ready video tapes to maximize the inherent economies of high picture quality two-inch tape.

The CMX 600 is engineered so that the operator can devote all his energies and attention to his art. High speed minicomputers perform every tedious chore, remembering the edit decisions, and accomplishing the assembly of the finished master.

The CMX 600 system enhances an editor's artistic creativity and provides operating and material economies by featuring direct access to any frame in any scene or take in up to an hour's film or tape material; frame-by-frame decision making and electronic splicing; instantaneous and smooth reply of any number of scenes as they are edited, the first editing device ever to feature this immediate 'rehearsal' mode; review of editing decisions electronically before final assembly; frame-by-frame audio, even slow and fast action; totally automatic assembly of time-based stable, NTSC color air tapes, which are only second generation (complete frame-by-frame printed instruction for film assembly).

Also, complete compatibility with existing quadruplex VTR's; however, VTR's cost is eliminated during editing and minimized by fast, automatic assembly during off hours.

The result of two years' development, the new system utilizes special video signal processing techniques to store discrete video frames on computer disc packs.

According to studies made by CMX Systems, a typical film production house could amortize a CMX 600 system in 12 months through savings in film and processing alone. For tape production, it offers a 50 to 70 percent reduction in editing time, even greater economies in VTR machine time during assembly, and frees VTR's from from decision-making sessions.

Circle Number 60 on Reader Reply Card

The Grass Valley Group made available a helical scan VTR processor system, the 940H. The new systems replace all sync and blanking pulses missing during the period of the helical scan—slant track—VTR dropout.

By inserting standard pulses into the video signal, dubs to other helical scan or quadruplex machines can be made. Also, synchronizing pulses available from the 950H sync generator can be used to drive cameras and special effects systems.

All models employ the same type mounting frame, and the monochrome version (940H-1) can be converted to color at any time by insertion of a 955, 962, or 966 module.

Circle Number 61 on Reader Reply Card

Circle Number 26 on Reader Reply Card

Data Processing System

STARCOM, by **Sarkes Tarzian,** is a sophisticated, low cost data processing system for TV stations. STARCOM provides a complete, turn-key business service for the administrative operations of the station.

An important feature is that the system can be operated by a clerk-typist without specalized, computer or key punch training. The terminal contains storage facilities so that a reduction in operating costs can be realized by choosing the lower cost telephone rate periods to transmit and receive data from the computer. A further reduction in operating costs is realized through the use of high speed data transmission techniques.

STARCOM contracts are entered into the system using a short form and abbreviated information. As the data is entered, the terminal displays the information and automatically checks for appropriateness of information being entered. The computer will automatically compare the start/stop information entered and run duration to see that it was correctly calculated before entry.

The weekly, monthly and quarterly flight cost summaries are computed by the system and entered on the contract. No more time is spent on complex tabulating and retyping of forms, and clerical errors are essentially eliminated; the computer types out the finished contract/confirmation.

Commercial instructions are entered into the system, and are referenced to contract and spot numbers. Seven days before a contracted spot is to run, the computer alerts station personnel of missing or incomplete commercial instructions. The alerting process will continue until the proper and complete information is entered for the contract or the air date has passed.

A daily avails summary is printed at the station. It is organized by day of the week horizontally across the page, and time of day vertically through the pages. Data for each program period is given for four weeks into the future. The operator may select any four week period desired. Each block of data gives the name of the program, the time of day, sold time in seconds for each of four sales categories, and time available or oversold.

After a log has been aired, an actual broadcast report is given to the system. This is an exception report, and only differences from the system-printed log need to be reported. After actual broadcast information has been entered, the system compares all broadcast log information with the contracts files and returns a billing discrepancy report which details any unresolved problems which will result in invoice errors or inaccuracies, or which result from written-in spots for which no contract has been entered.

Circle Number 62 on Reader Reply Card

TK-44A Sensitivity Option

RCA's newly-developed Scene Contrast Compression system is the latest result of a continuing engineering program to make the TK-44A color camera an even more effective broadcasting device.

The SCC system makes it pos-

sible for the camera to reproduce picture detail sometimes hidden or lost in the dark areas of the television scene.

RCA engineers emphasize that the SCC—which functions like the contrast control on a TV receiver—brings in this additional detail without compromising picture quality elsewhere in the scene.

The new system enhances TK-44A performance, and home viewer enjoyment, in televised sports and other outdoor events, especially when the action shifts to the shadows. It also improves camera performance under adverse lighting conditions so that picture detail in the shadows can be reproduced with clarity.

The standard TK-44A camera has the inherent ability to operate at extremely low light levels, 15 footcandles and below. However, the contrast range in bright sunlight and deep shadows at sports events sometimes climbs to 1,000 to 1, whereas the television system is capable of handling a range of 50 to 1. The new RCA developments compress the high scene contrast into a ratio that the TV system will accommodate.

The new SCC system is part of an Extended Sensitivity Option for the TK-44A camera. The optional module includes bias light for minimizing scene "lag" during low light level operation, the SCC system, plus RGB "coring." The latter is a new technique for reducing picture "noise" under low light conditions.

Circle Number 63 on Reader Reply Card

FM Transmitter

American Electronics Laboratories put their new FM-25KD 25 kW transmitter on display. Human engineered, this one includes a push button control panel and meter layout combination that keeps all controls at one level. That means you no longer turn control knobs at chest level while reading meters at or above eye level.

The FM transmitter also features two tube output, solid state control circuitry, automatic power output control, automatic recycling, no neutralization of final, positive cabinet air pressure, and remote control provisions.

The final tube is a 3CX15,000A7 operated in a grounded grid configuration. The application of positive forced air in the cabinet was included to increase the possibility of longer tube life and decreased dust accumulation.

Circle Number 64 on Reader Reply Card

Broadcast Cassette

Gates Radio Company, a division of Harris-Intertype Corporation, introduced its new professional Broadcast Cassette playback and recorder system at the 1971 NAB convention.

Combining the features of reel-to-reel equipment and endless-loop tape cartridges, Gates' cassette playback and record units herald a new era of convenience for the broadcast industry.

For commercials, a control tone automatically cues the cassette to the beginning of the next spot with the important added advantage of being equipped to re-record any portion of the tape.

An auxiliary tone recorder after the last commercial causes the cassette to rewind automatically and to cue to the first commercial in a matter of seconds. Rewind time is

approximately one second per commercial.

More than 100 individual items can be recorded on a single cassette. Another important feature of the system is the ease with which any one of these many events stored on the cassette can be located and a new event recorded (erasing the original) without affecting other material on the cassette.

Gates' cassette units are available in playback only or record/playback combination models, in monaural or stereo. All units are equipped with slide-out chassis for ease of maintenance.

The recorder has a professional three-motor transport with a synchronous capstan drive motor and a solenoid-operated capstan drive assembly, including a cue position for safe monitoring of the tape in fast forward or rewind modes.

Gates also introduced its new 50 kW high band VHF color television transmitter, the BT-50H, at the convention.

The transmitter consists of five cabinets—a 1300-watt exciter/driver, an aural amplifier, a visual amplifier driver, and two 25 kW single tube visual amplifiers paralleled for 50 kilowatts output. The BT-50H is equipped for complete remote control operation.

The new Gates BT-50H employs IF MODULATION (as does every Gates TV transmitter) in place of conventional high level techniques, for unsurpassed color performance. In this system, picture and sound signals are processed, modulated and corrected at very low power levels. These signals are then increased in power through extremely linear power amplifiers to obtain desired output power.

Circle Number 65 on Reader Reply Card

Program Controller

Sparta Electric Corporation has introduced their 1052 automatic program controller.

The 1052 provides fully automatic start/stop control and overlap audio switching for 10 channels of audio switching, plus two special channels for network audio and fill music.

The basic model has a 52 event format capacity, with a priority interrupt feature which provides time-controlled insertion of additional events. One or more FX-52 Format Extenders can be added to the 1052, each providing an additional 52 event format.

An 11 x 52 matrix board contains the format information. The board is programmed with removable diode pins. A skip bus provides for skipping any undesired event. Front panel switches delete any audio sources from the format, without reprogramming the board.

Audio source 10 is controlled by a Priority Interrupt circuit, and also from the matrix board. The Priority circuit can be armed by depressing the front panel switch or by an external clock signal.

The SPARTAMATION 1052 Automatic Program Controller is intended for use with any combination of broadcast quality reel or cartridge tape reproducers, capable of providing an audio level of 0 dBm into a 600 ohm load. It is preferable that cartridge reproducers be equipped with 150 Hz auxiliary tone detectors. If reel reproducers are used with the 1052 Hz, a 25-SEN 25 Hz Sensor/Filter will be required. A single 25-SEN connected to the 1052 Program Output will suffice for the entire system. However, individual 25-SEN's can be used with each reel transport if desired.

Circle Number 66 on Reader Reply Card

60 Kilowatt UHF Klystron

A new UHF klystron offering for the first time television transmission power ratings up to 60 kilowatts of synchronizing-peak-power is announced by **General Electric Company.**

The new klystron, the ZM-6805, by GE's Microwave Tube Operation (MTO) will be included in General Electric's TV transmitter exhibit at the National Association of Broadcaster's show at the Conrad Hilton hotel March 28-31. GE also is introducing but not showing the new 30-kW UHF klystron (ZM-6806) and a new ZM-6807 klystron for aural service.

Other features include a coaxial ceramic RF output window with 3⅛-inch coaxial output connection, an isolated collector, and a modulating anode which permits electron beam current to be adjusted to the proper level for aural operation at the voltage required for the visual amplifier.

Ion pumps are incorporated on each klystron type to insure that a high degree of vacuum is maintained.

Circle Number 67 on Reader Reply Card

TV Zoom Lens

Angenieux Corporation of America exhibited the 15X18E (f/2) zoom lens with a basic focal length capability of 18-270mm, and a total focal length range of 18-675mm using the range extender turret. The complete 15X18E is an entirely new concept in studio/remote lenses, and a new standard since the introduction of the first 10:1.

The short focal length of 18mm (51° horizontal angle) has been retained and the longer focal length has been significantly increased from 180mm to 270mm. The aperture of f/2 (f/2.4 for the lightweight "L" model) remains constant throughout for focal lengths between 18 and 180mm, thereafter dropping linearly to f/3 (f/3.4 for the lightweight "L" model) for the standard 1¼" plumbicon.

The 15X18E has a close focusing distance of 25" (21.7" for the "L" model) and still retains its full zoom capability. With a close-up adapter and range extender the lens is also capable of full-screening an object of less than one-half inch in height. The exclusive combination of close focusing and longer focal length in the 15:1 makes available new possibilities for other optical systems.

The positioning of the range extenders is an integral part of the lens: All are housed in a turret at the rear of the lens which can be remotely controlled. An entirely new development and an essential feature of the 15:1, there are two important results: First, the need for a sliding carriage support system is eliminated thus reducing the weight; second, the essential ease of controlling the range extenders from the rear of the camera by means of a small electric motor activated by a turret command box, a changeover requiring only about one second.

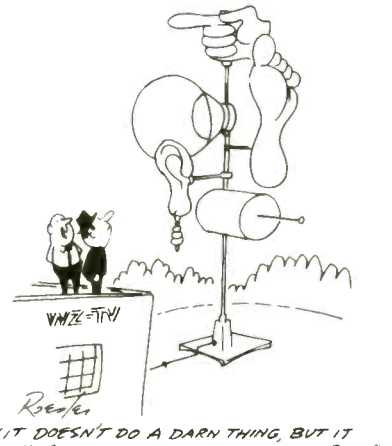
There are two essential differences between the 15x18 "E" and "L" models: 1) The "L" model is 5 lbs. lighter in weight; and 2) although the "L" model has a smaller geometric aperature there is only 10% less illumination on the image plane due to the better light transmission of its thinner elements.

Circle Number 68 on Reader Reply Card

B&W To Color Film System

A versatile process that greatly simplifies the taking and playback of color television programming was shown by **ABTO, Inc.**

Frank L. Marx, ABTO President, said that the new system uses ordinary drug store variety black and white film, either 16 millimeter



"IT DOESN'T DO A DARN THING, BUT IT HAS OUR COMPETITION WORRIED SICK."

movie or 2 by 2-inch slides. The film is developed like any other black and white film. It can be aired in color as soon as it is dry.

Mr. Marx said that ABTO demonstrated a prototype system incorporating this new process at last year's NAB convention and that the company has been refining the process since that time. This year ABTO introduced its first commercial model.

The new system was designed to simplify the taking and playback of color TV at all levels. "It will round out the color capabilities of large stations and networks as a logical addition to other color systems. Even greater benefits are possible at smaller stations and by CATV operators as well as educational, medical and industrial users," Mr. Marx said.

Circle Number 69 on Reader Reply Card

Automation Programmer

The **Broadcast Products** Model AR-2000 automation programmer has been designed to meet AM/FM formats. Provisions have been made for full random access capability of up to 36 Carousels or other multiple cartridge units in addition to up to 90 separate audio sources, such as reel to reel tape equipment, time announcers, network remote lines, etc. The standard AR-2000 allows the operator to preprogram up to 1000 program events. However, greater memory capability is available.

The 1000 events of memory can be sub-divided into any number of program blocks. The unit can be programmed to play any number of program blocks concurrently, regardless of their position in memory. All program entries are made through the use of a standard 10 digit keyboard. Two Sets of program displays have been provided. The upper set of displays indicates the next event in program while the lower set is used to look at any event in memory.

In case of power failure all program information in memory is sustained through the use of a self-contained, automatic battery change over system. Through the use of an external clock or Broadcast Products' 5025 Time Gate, the AR-2000 can be instructed at any time of day to go to any given point in memory to begin a totally different operating format. In addition to manual keyboard program entry an optional punched tape programming unit is available.

Circle Number 70 on Reader Reply Card

Projector/Recorder

A new 16mm Kodak Pageant sound projector that combines the most up-to-date conveniences and versatility in magnetic sound recording was introduced by **Eastman Kodak Company** at the convention.

The Kodak Pageant sound projector, magnetic-optical, model AV-12M6 offering both magnetic and optical sound playback as well as magnetic recording, is designed for sound editing and use in a television film previewing room.

The magnetic recording section of the new Pageant projector contains pre-amp high and low level inputs for microphone and high level phonograph are provided and are independently controlled for mixing; separate independent master volume control; and VU meter; special solar cell for noiseless optical sound pick up.

The AV-12M6 offers magnetic sound recording on full, half, or quarter-width film tracks at two speeds and is equipped with a solid-state amplifier providing a 12-watt 'music power' output and a frequency response of 20-35-000 Hz.

Supplied with the projector are a microphone and an 11 x 6-inch oval speaker, giving complete capability for quality recording and playback. Corrections in magnetic recording are made easily and re-recording automatically erases the previous recording.

To project screen images that are brilliant from edge to edge, there is an easy-to-operate master control

lever activating motor and lamp. The projector is equipped with a 2" f/1.6 lens and a 750-watt lamp. It can also accommodate a 1,000-watt lamp or a 1,200-watt lamp.

Circle Number 71 on Reader Reply Card

New Compact Film Processor

Jamieson Film Company's Equipment Division has unveiled the latest addition to its color film processor line. The new processor, designated the Compac 16/8, is priced at $6,980. It is designed to run 16 mm or 8 mm color film with complete interchangeability.

According to Hugh Jamieson, executive vice president, the Compac 16/8 has the same features and advantages found in Jamieson's larger models. It conducts the standard ME-4 process at 20 feet per minute. The unit takes only ten minutes to warm up, and it has the ability to force two stops without slowing down.

Jamieson offers as standard equipment on the new Compac 16/8 a 2000-foot magazine, feed elevator, patented tube tanks for high picture quality and economical cost, and a new quiet buffer squeegee.

It also features a full set of automatic controls and flow meters as standard equipment. The processor is a space saver because of its compact integral design.

Another version, the Compac 35/16, to process 35 mm color slides and 16 mm film interchangeably is also available at the same price.

In introducing the Compac 16/8 and the Compac 35/16, Jamieson says the pride and operating efficiency of the units will enable the smallest of television stations to have color processing capabilities at a cost that is compatible with their budgets.

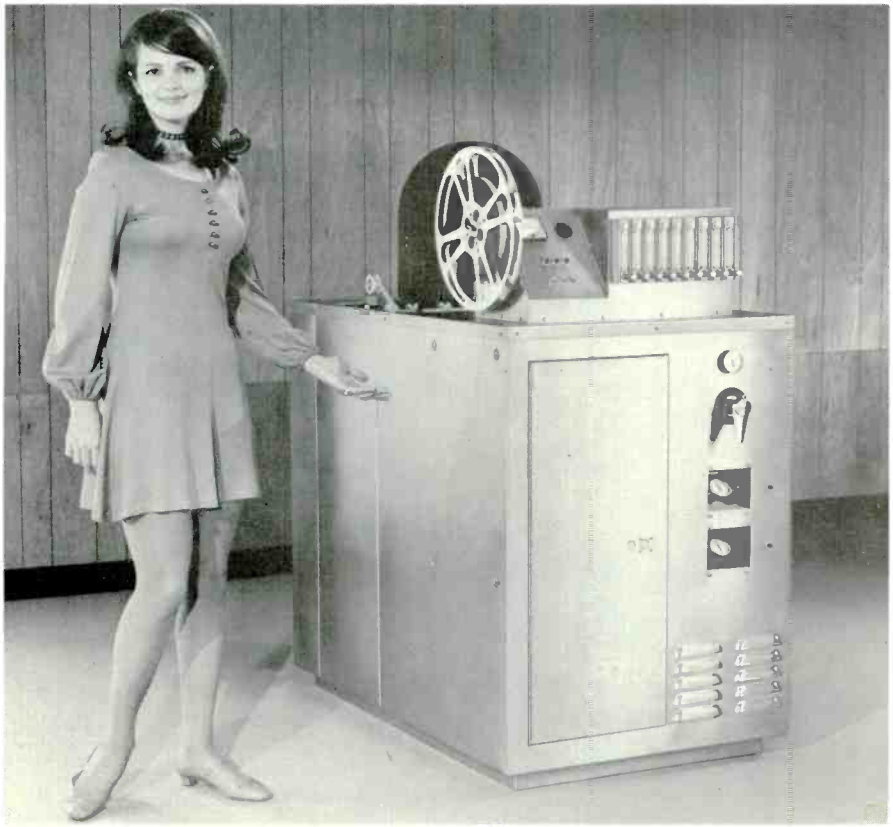
Circle Number 72 on Reader Reply Card

Television Modulation Monitor

McMartin Industries, Inc., Omaha, Nebraska, has expanded its broadcast product line to include the TBM-5500 VHF-TV Aural Modulation Monitor.

Bearing FCC Type Approval #3-184, the TBM-5500 complies fully with Section 73.694 of the FCC Rules and Regulations pertaining to frequency response, distortion, peak indication and meter ballistics.

Every component has been selected to insure highest reliability. Critical circuitry has been placed on plug-in cards with rack front access by virtue of a slide-mounted chassis.



Circle Number 35 on Reader Reply Card

In addition to its function as a semipeak modulation percentage meter, the panel meter may be used, by front panel switch selection, to measure AM signal-to-noise, FM signal-to-noise and input RF level. When in the AM or FM signal-to-noise positions, a 75 microsecond deemphasis network is automatically inserted into the meter amplifier circuit.

Separate, totally-isolated, front panel and rear chassis composite output connectors are provided to facilitate test measurements or the operation of external devices.

The peak flasher may be adjusted to fire at a preset level over a 50 to 120 percent modulation range.
Price: $1,300, F.O.B., Omaha
Delivery: May 1971

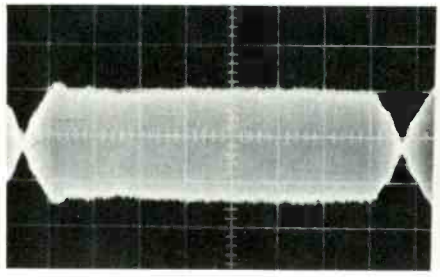
Circle Number 73 on Reader Reply Card

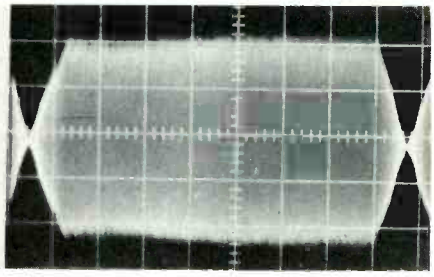
High Energy Video Tapes

A new generation of video tapes featuring a "High Energy" oxide compatible with both present and future equipment, as well as high speed duplication, has been introduced by **3M Company** of St. Paul, Minnesota.

Considered a technological breakthrough by 3M, the new proprietary magnetic oxide is capable of delivering substantially increased performance in signal-to-noise, color purity and other desirable characteristics.

Daniel E. Denham, general manager of the Magnetic Products division, says the new cobalt-modified ferric oxide developed by his laboratory researchers makes possible a whole new series of video tapes—some to be introduced immediately and others to be tailor-made to future applications. Denham says this tape-making technology is vital to high speed duplication systems under development and to the much-talked-about video cassette systems.





The output increase over standard tapes is particularly important. Because of multiple editing and dubbing, most release tapes are fourth generation copies of a master. The signal at this stage of production is good and useful, but down 4.5 dB in signal-to-noise from the original.

"If the entire process is accomplished using 3M's 'High Energy' tapes," he says, "a 4 dB improvement can be gained over today's release tapes. Even substituting a more economical standard tape for the final release tape would incur a barely-noticeable one dB loss as compared to conventional masters."

Denham disclosed the system will be able to utilize three copy stations simultaneously, duplicating at a tape speed of 150 inches per second. Conventional video tape duplication is accomplished in "real time"—

15 inches per second for quadruplex broadcast tapes and lesser speeds for helical tapes.

Circle Number 74 on Reader Reply Card

Portable Video Switcher

A video switcher with the capabilities to serve as the heart of a professional-broadcast-quality video production system has been introduced by **Ball Brothers Research Corporation.** Called the Video Production Center, it is small enough (19″ wide by 10½″ high by 5¼″ deep) for use in applications requiring portability, yet sophisticated enough to serve as a studio unit.

The Video Production Center allows eight separate video inputs, from either synchronous or non-synchronous sources. Using the Center, you can select any of the inputs for broadcast, preview one signal while broadcasting another, mix signals, "wipe" horizontally, vertically, or corner-to-corner, and create special effects, such as split-screen images. And the Center can be mounted in either a standard EIA rack, or a sit-down console.

Circle Number 75 on Reader Reply Card

"SO THE FCC WANTS ORANGE BANDS! --- I PREFER ROBINSEGG BLUE."

New Color Camera

TeleMation, Inc. has introduced CHROMA III, a professional broadcast color camera.

Initial design work on CHROMA III was begun in late October, 1971. TeleMation's prime objectives were: a) reduce the number and frequency of color camera adjustments and increase electronic stability by incorporating totally new concepts in circuitry design; b) improve colorimetry by developing color separation optics that would compensate for all the known variables affecting color reproduction in television; c) provide true remote capability, allowing a studio camera to be instantly converted to a field camera with a minimum of time and expense; at the same time allowing no compromise in the quality of pictures derived from the camera.

The camera incorporates a built-in NTSC color encoder which represents a radical departure from conventional encoder designs. Digital phase shift circuitry establishes overall I, Q, and burst phasing accuracy of better than 1° with no adjustments; amplitude relationships are held to better than 2%; a completely new balanced modulator design provides over 50 dB carrier rejection from 0° to 60° Centigrade with no balance adjustments necessary; digital balanced modulators receive 3.58 MHz square waves at precisely 90° quadrature; switching-type circuitry eliminates amplitude and phase drift and supplies clamping action during each cycle to effectively eliminate residual carrier; junction matching of complementary semi-conductors provides immunity to the effects of temperature changes.

The encoder also includes current-summing matrixing for greater precision input clamping, mixed highs from green and level-dependent aperature correction. Color bars generated by this circuitry are so precise that Vectorscopes may be eliminated as necessary set-up equipment.

Shading is accomplished by a single pushbutton operation. Digital shading, a new concept in television, provides for video level sampling at 25 discrete points on each of the three channels with both horizontal and vertical integration of these samples. After initial set, channel

gain is automatically modulated to maintain exact shading corrections.

CHROMA III design ensures that registration is drift-free. Camera electronics incorporate deflection circuits so stable that a 2:1 change in deflection coil resistance produces no detectable change in deflection waveform or position. A digital pre-regulator provides uniform voltage to the camera and viewfinder resulting in total insensitvity to line voltage variations from 80 to 140 volts, and the effects of temperature changes on camera registration are minimal.

Setup is also a pushbutton operation. The camera need only be pointed at a white card with a black central area and the appropriate button depressed. Video gain and pedestal level for each of the three channels are automatically set, thereby establishing both correct color balance and output video level. Solid-state memory circuits maintain both black and white set.

Two remote control options are available for use with CHROMA III. Both configurations allow the camera output to be automatically phased to any system with up to 2,000 feet of camera cable. Output can also be set to compensate for external delays so that the picture arrives at the designated switcher in the precise time and phase as has been system selected, requiring no delay lines, no cable cutting, and no external phasing.

Since full NTSC/EIA pictures can be produced directly from the camera head, using standard coax cable or 2-element, ½" camera cable, CHROMA III represents the first truly self-contained broadcast color camera and should prove ideal for instant news coverage, sports and special events remotes. The camera can be removed from the studio, transported to remote locations, and be ready for operation instantly.

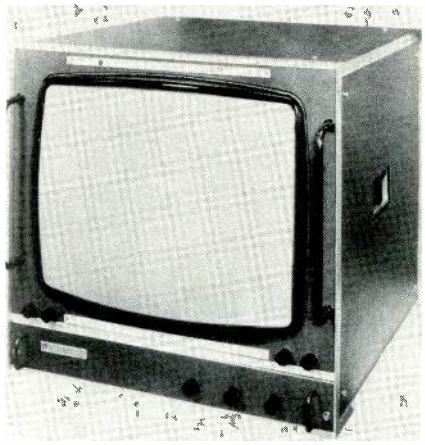
Circle Number 76 on Reader Reply Card

TV Monitors

Two new solid state television monitors—a 22-inch color unit with NTSC decoding and a 20-inch monochrome monitor with illuminant "D" phosphor—have been introduced by **Rank Precision Industries, Inc.**

Both units are designed with the same finish and overall front dimensions so that they present a coordinated appearance when used together in a stacked configuration.

They both operate on either 525 or 625 line standards.



The 22-inch color monitor, which is also available with PAL decoding, has a new 4:3 aspect ratio tube and is equipped with transistor matrixing circuits to ensure a high standard of stability. The unit has active convergence circuits for independent registration, with an ergonomic layout of convergence controls.

The monitor is equipped with two RGB inputs and provision for loop through of video and sync inputs. Its display capability includes red, green, blue, complete color or monochrome. Front panel controls include power on/off, input ½ selector, brightness, contrast, remote/local control, focus and a color selector switch. Remote controls are also available.

The new 20-inch monochrome monitor has a number of outstanding features, including scan generators of high linearity and stability, two video inputs with electronic switch selection, a notch filter to give a 12 dB notch at the color sub-carrier frequency, and an independent solid state e.h.t. generator providing a stabilized supply at low impedance.

Circle Number 77 on Reader Reply Card

Alignment Tape

Featured products at **Nortronics** booth included a new professional cassette alignment tape by Nortronics Company, Inc., the world's largest manufacturer of magnetic tape heads. The test tape incorporates a zero reference tone and a

complete range of frequency responses (DIN standard) in addition to azimuth alignment.

"This is one of a series of alignment tapes and recorder accessories being added to the Nortronics line", reports Roger Czerniak, Distributor Sales Manager. The test tape is available through Nortronics Distributors at $21 each.

Nortronics' display at the NAB convention also included VTR audio head replacement and relapping service, professional tape/head liquid or spray cleaner, Ampex and Scully head nest rebuilding service, and multi-channel head relapping service.

Circle Number 78 on Reader Reply Card

"BE MORE CAREFUL HOW YOU STORE THESE STATION LOGS!"

TECHNICAL DATA

For further information, circle data identification number on reader service card.

100. EDISON ELECTRONICS DIVISION — McGraw-Edison Company. A Daven Delay Line Buyer's Guide (DL270) has been developed to assist system and circuit designers in specifying high performance minimum cost delay lines for their systems and circuits. This brochure provides a valuable glossary of terms and formulas. It also offers technical and cost application details.

101. GENERAL AUTOMATION, INC.—A new six-page brochure describing operating systems for General Automation's powerful System 18/30 Computer is now available. These versatile operating systems extend the performance and capacity of System 18/30 Computers and make them especially suited for high-performance industrial automation and control applications as well as scientific, communications and business activities. The new two-color brochure describes five operating systems: (1) Real Time Operating System—a combined real-time foreground multi-programming executive and a user-oriented background batch operating system, (2) Real Time Executive—a small efficient real-time executive, (3) Disk Based Operating System—a flexible user-oriented batch operating system, (4) Time-Shared Supervisory System—a flexible foreground/background operating system that is IBM 1800 compatible, and (5) Disk Monitor System—a disk-oriented batch processing system that is IBM 1130 Compatible.

(Continued on page 68)

102. THE HICKOK ELECTRICAL INSTRUMENT CO.—The newly published Hickok Service Test Instruments 1971 Catalog contains photographs, condensed specifications and prices for Hickok tube testers, transistor testers, oscilloscopes and signal generators. These instruments are used in industrial, communications, laboratory and service technicians' applications. Both bench top and portable models are shown.

103. METROLOGIC INSTRUMENTS, INC.—A new 32-page catalog featuring helium-neon gas lasers for industrial, research, and educational applications has just been published by Metrologic Instruments. Seven laser models ranging in price from $99.50 to $275 are described and illustrated. Laser education kits designed for optics experiments in school science departments also are prominently featured. In addition, the catalog covers Metrologic's laser communicator and holographic systems. Complete details on power supplies and power supply kits, optics benches, photometer, and laser accessories are also provided. The catalog gives price information on all items and a cross-reference page simplifies the selection of equipment. An optimum combination of safety and utility makes the lasers especially suited for such applications as holographic recording and projection, alignment, interferometry, optics instruction, communications, metrology, laser research, and spectroscopy.

104. PHELPS DODGE COMMUNICATIONS CO. — Cufil™ a new copper corrugated, air dielectric, coaxial cable is covered in a four-page catalog. The new literature describes Cufil™ in detail including complete electrical and mechanical data as well as shipping information on the cable in ⅞" diameter and 1⅝" diameter sizes. A cutaway illustration depicting construction is incorporated as are illustrations of available matching connectors. Connector design features are shown in diagram and a dimension chart which correlates the available connector with the appropriate cable size is included. Also offered are curves on "attenuation vs. frequency" and "average power rating in air at 40°C." Accessories are listed including cable grips, guide ring hangers, stainless steel strapping, splice protection kit and grounding kit.

105. RAYTHEON COMPANY—Sorensen SRL series low voltage, regulated solid-state DC power supplies featuring an exclusive quick set and check built-in overvoltage protector are described in a new brochure. Complete mechanical and electrical specifications are listed for 14 models with output voltages ranging from 0-10 VDC to 0-60 VDC and output current ranges up to 100 amperes.

106. RCA—A new booklet entitled, "Solid-State Power Circuit Modules—High-Power Arrays", is now available. This booklet describes a new design approach to high-power solid-state circuits: arrays of power transistors, rectifiers, and resistors to 300 A and 800 W using "hybrid" techniques. Specific by-type descriptions of a number of individual inverter, switching, output, and unconnected arrays, including circuit diagrams and applications information are also included. More general material covers the array concept, the basic arrays, and the array building blocks.

107. RF SYSTEMS, INC.—A new series of catalog data pages describing the firm's CATV antennas and systems is now available. The "Astroscat" parabolic antenna in diameters from 20′ to 60′ is described, along with the "Miniscat" antenna which is a simplified version of "Astroscat". YAGI antennas for CATV systems are said to be ruggedized, available in 6 and 10 element models. Various series of RF Yagi antennas are specified for channels 2 through 13. High performance "Astrolog" antennas for broadband CATV arrays are listed as having high front-to-back ratios, low lobe profile, low VSWR and low loss. Front-to-back ratios are stated to be 25 to 30 dB. "Astro Yagi" antennas for channels 2 to 13 and FM are designed for easy installation, and provide high gain characteristics. Each catalog page contains complete mechanical and electrical specifications for the product.

(Continued on page 70)

bookreview

International Law

International Telecommunications And International Law: The Regulation Of The Radio Spectrum. That's a long title for a new book out by David M. Leive . . . and its about 400 pages of must reading if control of the spectrum means anything to you.

While the text could stand alone as a reference book, it also is important in that Leive makes several recommendations for way and means of improving the international regulatory regime. Should stand as a welcome contribution to the subject.

This one is available through A. W. SIJTHOFF/ LEYDEN, OCEANA PUBLICATIONS, INC., Dobbs Ferry, N.Y.

Closed Circuit TV

Closed-Circuit Television Handbook serves as a ready guide to the prospective user, as well as the installer of CCTV. Leon A. Wortman explains the basic concepts of CCTV systems in an easy-to-understand language.

The equipment requirements—from a simple system with only one camera and one monitor to exotic systems connected by many miles of microwave relays—are given. Many applications where closed-circuit TV is already being used are pictured and explained; these will help serve as a basis in planning other systems. The actual circuits used in modern systems are given.

New information on video tape recordings and recorders has also been included. A list of the various manufacturers supplying equipment is given in the appendix.

This book is available through THE BOBBS-MERRILL CO., INC., 4300 W. 62nd Street, Indianapolis, Ind. 46206.

TV Maintenance

Television Systems Maintenance combines the latest techniques the standardization of television systems maintenance procedures with a complete analysis of system malfunctions. A certain amount of fundamental systems theory has been included where important in maintenance practice.

Harold Ennes treats the television system as a collection and integration of units for selecting, combining, and transmitting video and audio signals. Comprehensive discussions are included for all units from the studio switcher inputs to the transmitter output.

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 home study or classroom use.

This book is available through THE BOBBS-MERRILL CO., INC., 4300 W. 62nd Street, Indianapolis, Ind. 46206.

CATV SCOPE

(Continued from page 18)

munications link can be used for transmitting cable signals to the monitoring facility. Since it would

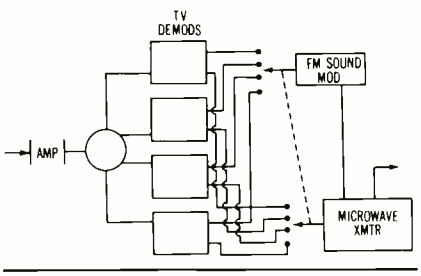


Fig. 6

be costly to monitor all channels simultantously using this technique, a scanner system can be used to allow visual appraisal of each television channel, one after the other. The equipment requirements are depicted in Figure 6. Here, switches S1 and S2 functionally represent the electronic scanner. Using this technique the microwave or optical communications link need have capacity for only one television channel.

It is technically feasible to provide fault reporting capabilities at all or selected amplifier locations. This would make it easier to localize the section of the system requiring maintenance. Unfortunately, all of the required hardware is not yet available on an off-the-shelf basis. Using modern micro-electronic devices readily lend themselves to use in such applications.

Even with only head end fault alarm and all-channel monitoring capabilities, the service manager should be able to react quickly to any off-normal situation.

Tech Data

(Continued from page 68)

108. RHG ELECTRONICS LABORATORY, INC.—A new 12-page catalog (No. 71A) describing their line of microwave relay links, transmitters, receivers and components is now available. The new catalog contains detailed specifications on over 500 individual models of microwave FM transmitters, receivers, linear and log amplifiers, discriminators, mixers and mixer preamplifiers. Four pages describe and illustrate FM microwave relay equipment including air-to-air and air-to-ground relay links and portable and fixed ground stations. Photos and technical specifications describe the various models and their combinations.

109. SIGNAL ANALYSIS INDUSTRIES CORP. — A detailed discussion of correlation and probability analysis and signal enhancement is contained in a 20-page technical bulletin prepared by Dr. Ira M. Langenthal, Director of Research and Development, Signal Analysis Industries Corporation. As discussed in the bulletin—TB14—probability analysis is concerned with the amplitude characteristics of a signal while the correlation and signal enhancement portions deal with the dynamic properties. The bulletin explains random variables, distributions and densities involved in probability analysis and concepts and properties of correlation functions and signal enhancement. Numerous illustrations and examples of various functions are included along with pertinent equations. Photos of oscilloscopes presentations and block diagrams are also presented.

110. SOS PHOTO-CINE-OPTICS, INC.—A new soft cover, 60-page Lighting Equipment Book is now available. According to Dom Capano, president, the book took six months to compile. "We put in everything we sell in lighting for motion pictures, television and still photography", Mr. Capano said, "and to our knowledge it's the first truly comprehensive buying guide in the industry. You no longer have to go through dozens of catalogs to get the lighting information you

need. We've put it all between the covers of one book".

Represented are over 1700 lighting equipment products from 70 manufacturers, including Bardwell & McAlister, Colortran, Mole-Richardson, Lowell, Century, Kliegl, Strong, Pic Stands, Adapt-A-Cases, Sylvania and General Electric. Coverage includes diagrammatic plans for studios with coordinated basic lighting outfits, the most comprehensive list of professional lamps ever compiled, and complete detailed descriptions on: lighting heads and immediate accessories; portable lighting; lighting cases; stands, mounting and support equipment; dimmers and electrical controls; electrical supplies and accessories; reflectors; grip equipment; color media; miscellaneous and special effects items. (This book is available free of charge only to those involved in professional motion pictures and television.)

111. SPECTROL ELECTRONICS CORPORATION—A new two-color, two-page data sheet is now available from Spectrol describing the Model 534 ten-turn wirewound pot. The sheet contains an actual size product photo, dimensional drawings, specificiations, power rating chart and standard resistance element data.

112. SYLVANIA ELECTRIC PRODUCTS INC.—The Electronic Tube Division of GTE Sylvania Incorporated is offering a 65-page reference brochure which gives characteristics of over 2,000 types of receiving tubes. The comprehensive brochure has been published to provide fast information on principal electrical and physical properties of popular electron receiving tubes, including the latest designs for color television sets. Data is given for both GTE Sylvania tubes and those of other manufacturers.

113. TELTRON, INC.—The complete line of Vidicon camera tubes is presented in the new Short Form and catalog is now available. The Teltron Vidicon line ranges from Infra-Red Sensitive tubes—like the TV 2000 to the very high performance types like the TV 8000. Also included in the line are the more familiar types like the 7735B, 8051 and 80541B, along with the ⅔" 8823 and the ½" TV 9000.

114. TRYGON ELECTRONICS, INC.—A new 64-page Power Supply Handbook and Catalog of Trygon Power Supplies and power modules for systems, laboratory and OEM applications is now available. Trygon's complete line of transistorized DC power supplies and versatile rack adapters is included. This new handbook now includes information on the Super Trypack power module series recently introduced to industry. Updated information is also given on standard power supply models of UL design which can be assembled into systems or ordered fully wired and assembled or as separate units for customer assembly. Performance specifications and complete price information on over 200 power supply models for rack or bench use is included.

115. WESTINGHOUSE ELECTRIC CORP.—A new, illustrated catalog provides important data on over 100 cathode ray tubes (CRT's) for industrial and military applications. The 20-page catalog is both a guide to specific cathode ray tubes and a demonstration of capability for the design and manufacture of CRT's for special applications.

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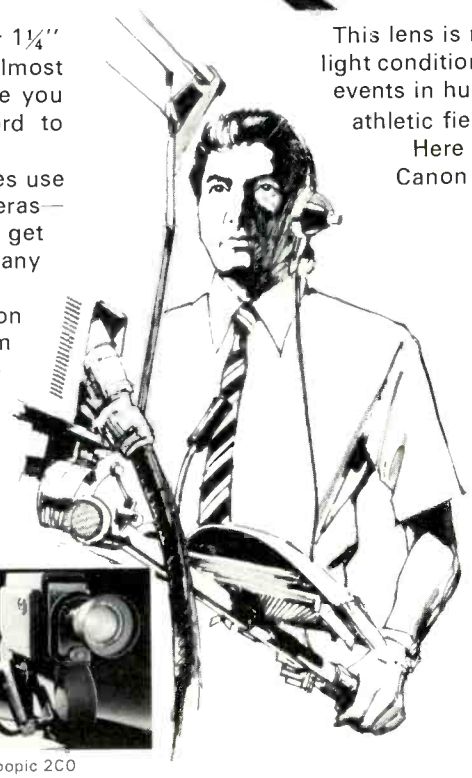

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1" vidicon	**V10X15** **V6X16** **V5X20** **V4X25**	**V10X15R(DC)** **V6X16R(AC/DC)** **V4X25R (AC/DC, EE)**
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Versatility is another advantage of the 701. By merely depressing a single button on the front panel, you can convert the two frequency errror counters to a general purpose, 6-digit frequency counter.

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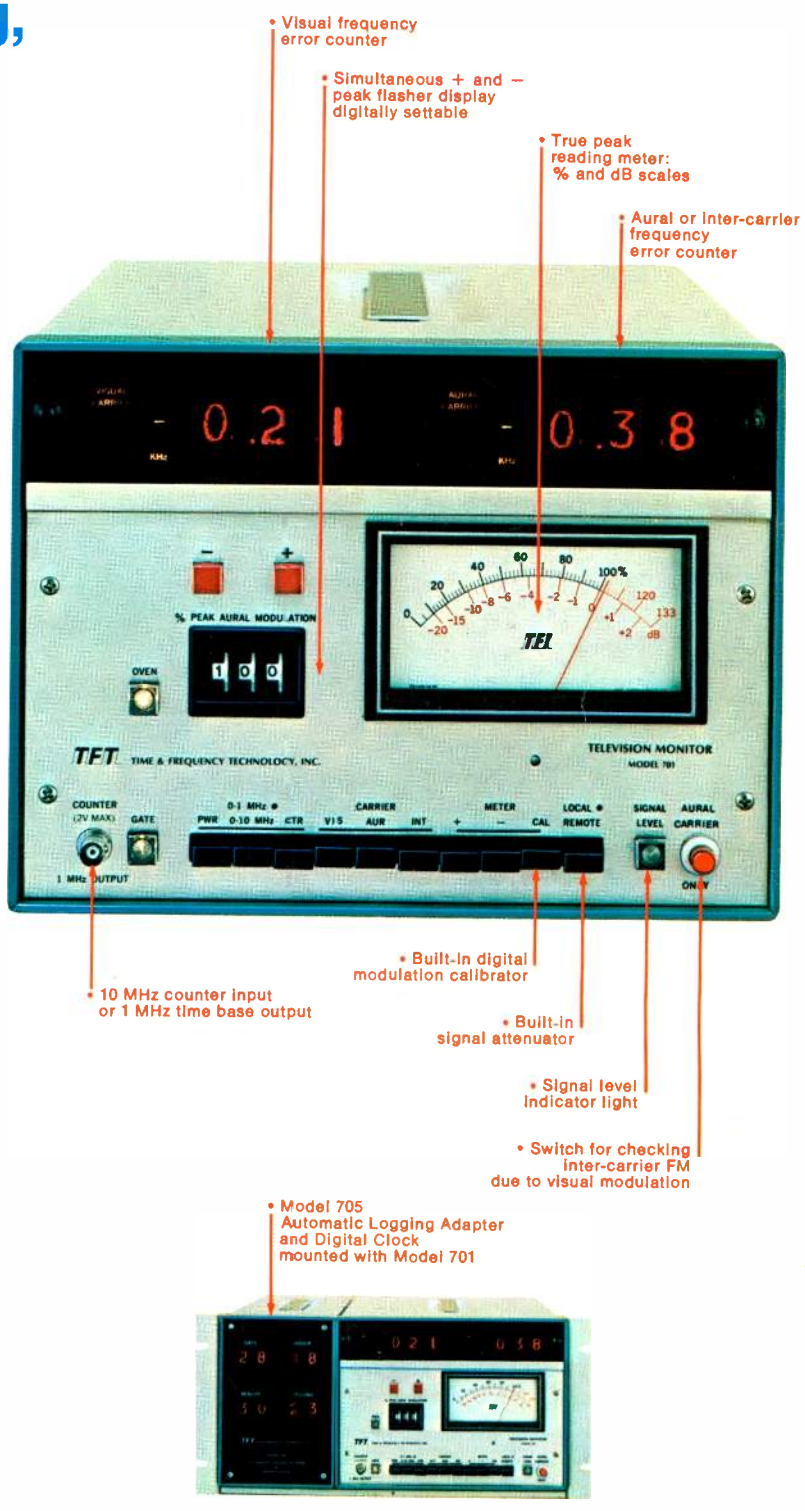

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