September, 1969/75 cents

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the technical journal of the broadcast-communication's industry

A HOWARD W. SAMS PUBLICATION

RFE's master control system, page 20

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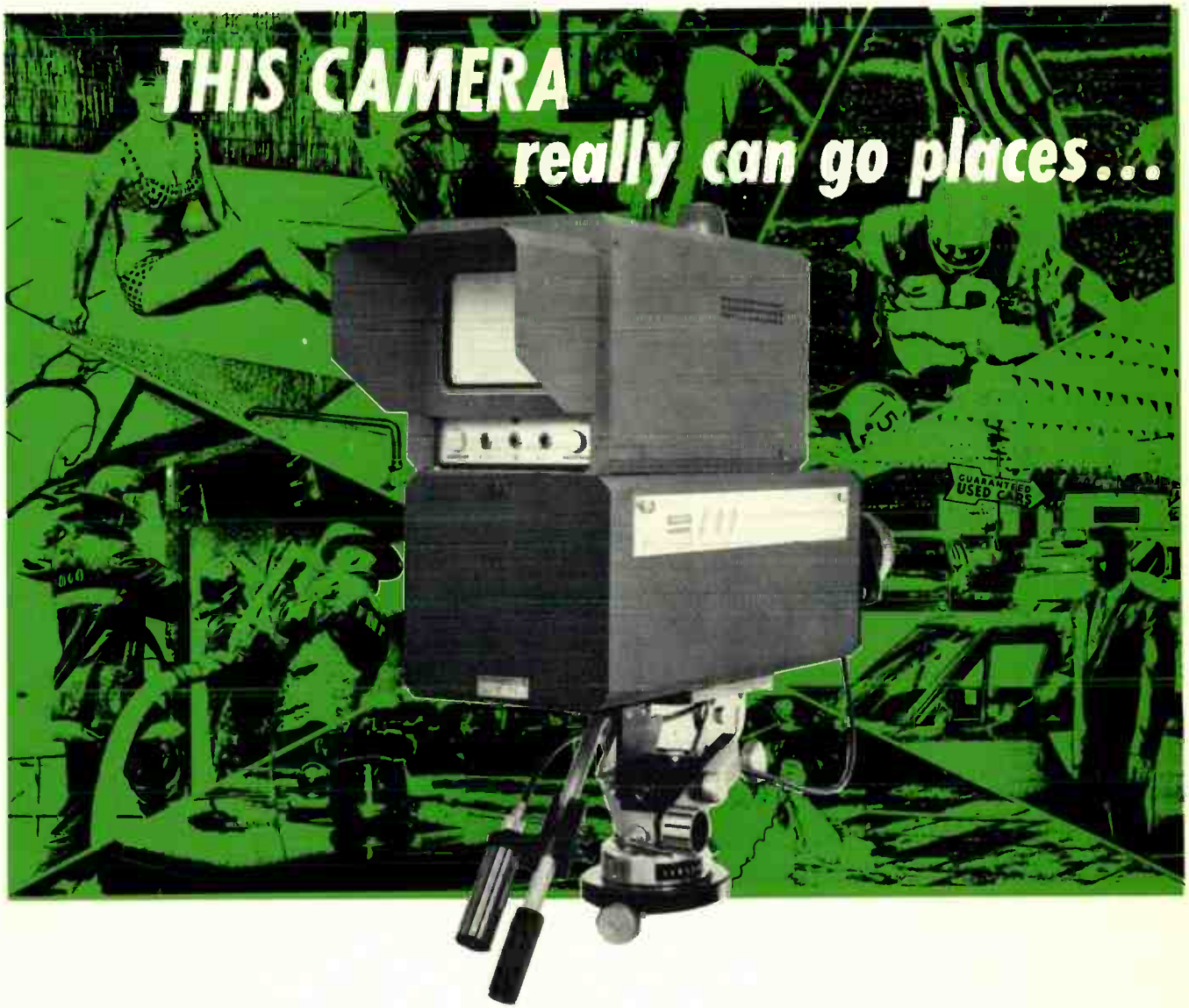

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September, 1969 • Volume 11, No. 9

Broadcast Engineering

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

Many of us have heard about Radio Free Europe. This month's cover picture shows the master control room that channels the many program inputs for transmission to countries behind the Iron Curtain. See article on page 20.

DEPARTMENTS

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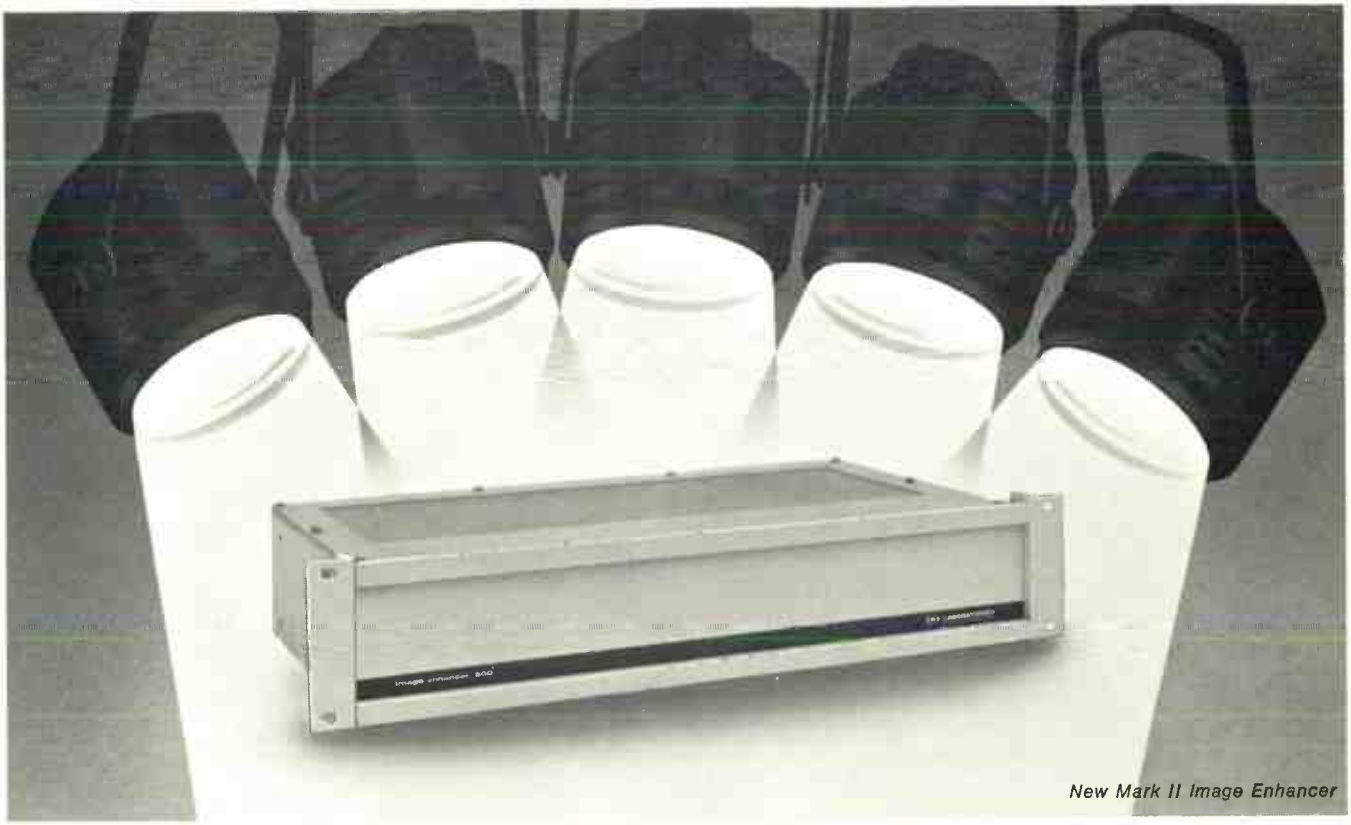

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DIRECT CURRENT FROM D. C.

September, 1969

By Howard T. Head

New EBS Signalling System Being Tested

The National Industry Advisory Committee (NIAC) is conducting tests for the FCC of a new two-tone emergency signalling system. Tests have already begun on several radio stations and will be extended soon to include a number of participating television stations.

The new signalling system is intended to turn on suitably designed radio and television receivers automatically upon the transmission of an emergency alerting signal. Several hundred receivers were specially designed for the tests, but if the system is ultimately adopted, receiver manufacturers will be free to provide their own designs of receivers responding to the alterting signal.

Early Action Expected on New AM Treaty with Mexico

The US Senate has ratified the new treaty with Mexico governing the use of the standard broadcast band. Word has been received that the treaty is expected to be taken up by the Mexican legislature for ratification this September, earlier than originally anticipated.

The new treaty provides for a number of changes affecting stations in the U.S. Of particular interest are provisions for power increases, both daytime and nighttime, for 250-watt Class IV stations on the local channels near the Mexican Border, and provisions which would permit pre-sunrise operation beginning at 6 A.M. local time for some 200 daytime-only stations operating on Mexican clear channels.

Changes Proposed in Method For AM Indirect Power Measurements

The FCC has proposed a number of changes in the Rules governing the determination of the power of standard broadcast stations. Of principal interest is the determination of power by the so-called "indirect" method, ordinarily used when, for any reason, power cannot be accurately determined by the "direct" method ($W=I^2R$).

Under the present Rules, power determination by the indirect method is established by applying a fixed efficiency factor (specified for each class of final amplifier) to the D.C. input to the final amplifier. The proposed new Rules recognize the fact that these efficiency factors, established some thirty years ago, are often not applicable to modern transmitters.

(Continued on page 6)

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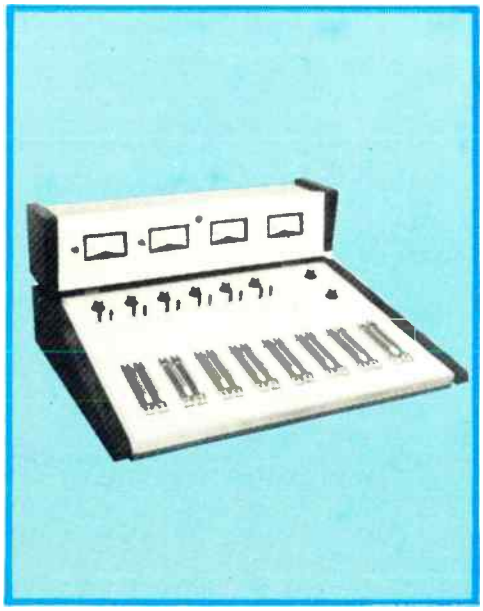

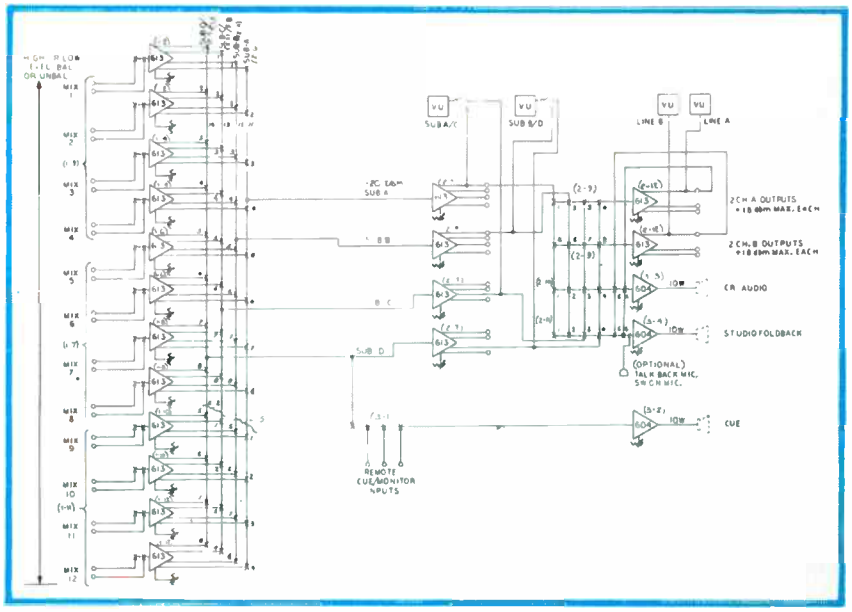

Under the proposed new technique, an efficiency factor would be determined for each individual transmitter, based either on past operating experience or, in the case of new transmitters, on the manufacturer's stated efficiency for each transmitter type.

Pre-sunrise Rules Adopted for Clear Channels

The Commission has adopted new Rules governing the pre-sunrise operation of daytime-only stations on the US Class 1-A clear channels. The previous pre-sunrise Rules were applicable only to the regional channels, the 1-B clear channels and the Canadian 1-A channels.

The practical effect of the new Rules is to permit pre-sunrise operation only in those instances where the daytime-only station is located to the west of the dominant Class 1-A station on the channel. In those cases, the station will be permitted to commence operation with 500 watts power at the time of sunrise at the dominant station, but no earlier than 6 A.M. local time.

AM Audio Proof of Performance Requirements Modified

The FCC has made minor changes in the Rules governing audio proofs of performance for AM stations. Carrier and hum noise are now to be measured against a reference level established with a 400 Hz tone. Audio frequency response is now required to be measured to a lower level of only 50 Hz compared with a previous requirement for measurement down to 30 Hz.

House to Vote on $35 Million Broadcast Bill

A bill authorizing $15 million for educational broadcasting facilities for each of three years commencing in 1971 and $20 million for the Corporation for Public Broadcasting for 1970 has been reported out of the House Interstate and Foreign Commerce Committee. The legislation now moves to the full House for a vote which is expected after the summer recess for Labor Day.

If the House passes the legislation, a House-Senate Conference will need to consider only facilities funds since the Senate has already passed the $20 million CPB authorization. The Senate-passed bill made no specific dollar recommendations for facilities.

Short Circuits

The FCC continues to waive the FM rules to permit the use of desirable transmitter sites at short spacings; numberous new FM assignments are also being made, but the Commission continues to adhere to the mileage separation requirements in making the new assignments . . . The US Court of Appeals has upheld the Commission's "suburban" requirements, intended to prevent suburban AM stations from delivering signals in excess of 5 mv/m to nearby larger cities . . . The FCC has reached agreement with mail order dealers in receivers to discontinue the sale of SCA receivers to the general public.

Howard T. Head

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LETTERS TO THE EDITOR

In the Beginning...

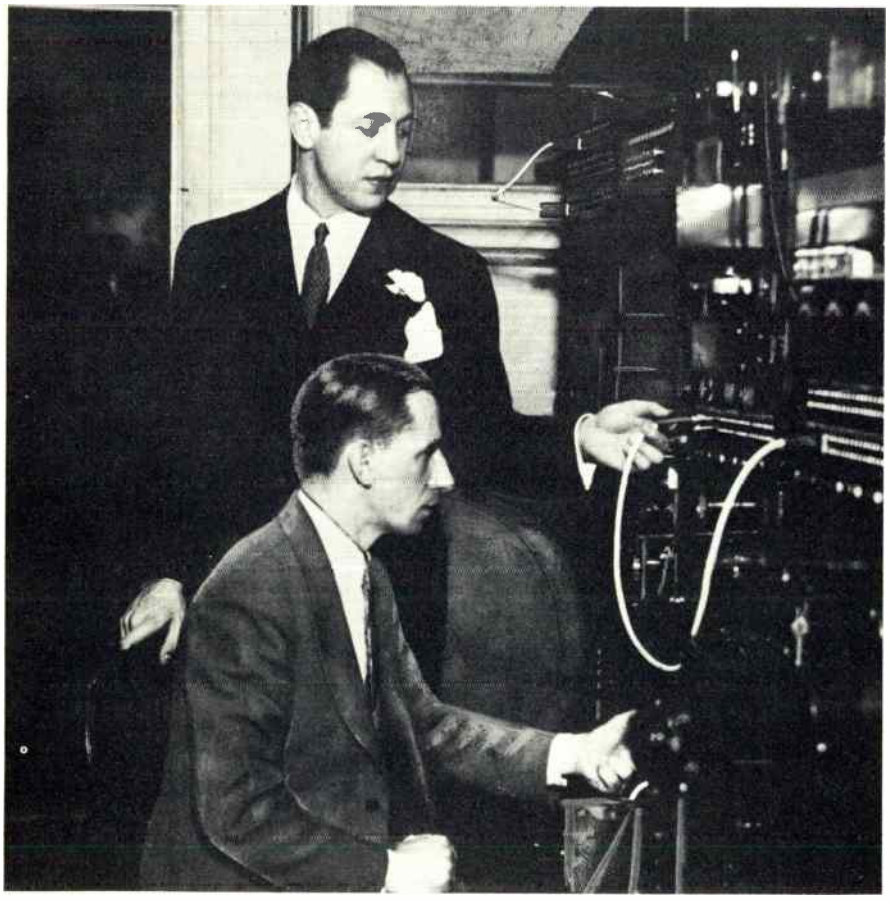
Dear Editor:

As this is the fortieth anniversary of the opening of the first coast-to-coast radio network of the forty-three stations of the Columbia Broadcasting System, I thought perhaps you and your readers would be interested in some of the highlights of the event.

The equipment was different then —large, bulky and extremely heavy. Can you imagine using storage batteries to heat the filaments of the amplifier tubes and getting 250 volts of plate battery from a string of Edison cells! We got pure DC, but we had to charge the batteries every night to get it.

Early in 1927, I was asked by A. H. Grebe to build and install the master control and studio equipment for his new radio station, WABC in New York. This also involved installing a "new" Western Electric 50 KW water-cooled transmitter which completely filled the main room of the building. A water circulating system was used to cool the 50 KW tubes to keep them from burning up and the water from the tubes was hot enough to heat the radiators that warmed the building.

At this time, all radio programs were live—live bands, live artists and live audiences. The first live boo-boo to go out over the air happened the night of the inaugral and went this way: William S. Paley, President of the Columbia Broadcasting Company had just completed his address and, as I was sitting at the master control, I switched to Philadelphia, Pa. for a church broadcast which was part of the ceremonies. The speaker was the Rev. Dr. Barnhouse and his opening words were to have been, "Through Our Lord, (pause) Jesus Christ," (pause) and then he would go into his sermon.



William S. Paley, President of the Columbia Broadcasting System, makes the contact on the control board that hooked up a regular network of forty-three stations for the first time. W. T. Abbott, chief engineer of WABC, is shown at the controls.

The announcer made the introduction and then said, "The next voice you hear will be that of Dr. Barnhouse." Then he switched from his mike to the one at the pulpit. Dr. Barnhouse, however, started before he had completed the switch and we lost the first two words. As he put plenty of emphasis on the last two words, you can imagine the effect it had as it came over the monitor speakers in the control room and the reception room where a large gathering was listening.

Back in 1927-28, before he became famous, Rudy Vallee and his orchestra broadcast once or twice a week locally over WABC with no sponsor and no commercials. We had installed a remote line from the bandstand in the Heigh-ho Club to our studios, with a microphone for broadcasts.

Many an afternoon, Rudy would call me over the PL and the conversation would go like this: "Say Warren, we're down here rehearsing for a couple of hours this afternoon, have ya got a spot open so we could get on the air?" Then I'd check my schedule and if there was a free spot, we got Rudy Vallee's music for free and neither Rudy or the club had to pay for the air time.

Another great I enjoyed working with when he first started was Ted Husing. I went with him to the Polo Grounds for his first baseball broadcast. We didn't have a broadcast booth, but sat out in the open in the grandstand. He worked the microphone and I handled the equipment.

The old programs such as Captain Henry, The Majestic Hour Around the Samovar, with David Ross reading poetry and Main Street Sketches were great programs, but they're gone because there were no acetate discs, ET's or tapes to preserve them. In the 1930's when a few engineers, including myself, began working with acetate disc recording, we often wondered how long the discs would keep before deteriorating. Many that I recorded over 30 years ago are as good as the day I cut them. I have donated many copies of my discs to the archives of colleges and institutions and eventually I will turn over my entire library to the Pacific Pioneer Broadcasters.

Warren T. Abbott
San Diego, California

Construction Costs For Silicon Rectifier Stacks

Dear Editor:

In reference to my article "Roll Your Own Silicon Rectifier Stacks" which appeared in the July issue of your magazine, there have been some queries regarding the actual cost of constructing the units.

The square units used in the RCA transmitter cost $127.40 each when constructed in June 1965. The round configuration used in the G. E. transmitter cost $154.60 each. The higher cost resulted in part from the inevitable rise in prices between June 1965 and February 1967 when the G. E. units were assembled, but was mainly due to the stud-mounted rectifier units which are more expensive than the press-mount type. Incidentally, the correct type number of the Westinghouse stud-mounted units is 1N1206, not 1N126 as appeared in the article.

The physical configuration of the units had little, if any effect on the cost, but was dictated mainly by the space available. The larger square type was fine in the roomy interior of the RCA transmitter, but would not fit in the restricted space available in the G.E. transmitter. The final design evolved from several bull sessions among members of the WCKY engineering staff, and the resulting unit is almost exactly the same height and diameter of the 857-B tube it replaces. Wider latitude in the physical proportions of the units is possible if they are not to be made as direct "plug-in" replacements. However, where a direct replacement is desired, the physical configuration is rather rigidly controlled by the size and shape of the tube being replaced.

James F. Ranney
WCKY
Ft. Mitchell, Ky.

JEM Conference Theme: Survival in the 70's

"The Engineering Manager: Survival in the Seventies" will be the theme of the 17th annual Joint Engineering Management Conference Oct. 8-10 in Montreal, Quebec. The session themes for the four-day conference have been announced by James G. Ripley, chairman of the General Conference Committee.

The theme of the morning session, Oct. 9, will be "Challenges of the Changing Environment." The speeches will cover the engineer's responsibility in the social and political spheres, trends in unionism in engineering, the influence of government on engineering standards and professionalism in engineering.

The principal speaker at the Thursday luncheon will be J. P. Gignac, Commissioner of Hydro Quebec and President of SIDBEC. The afternoon speeches will deal with computers and the future, creative distribution of technical information and the transference of technology from the laboratory to the market. The theme of this second session is "Challenges of Exploding Technology".

Session III, Oct. 10, will explore the "Challenges of Emerging Individualism" with speeches on engineering education, the development of managers from engineers and the utilization and motivation of technical personnel. Congressman Anderson of the Joint Committee on Atomic Energy will highlight the list of luncheon speakers.

The two-day conference will end with the theme, "Restructuring the the Seventies". Topics under discussion will include a new philosophy for engineering managers, the manager's responsibility in the areas of unemployment and social unrest and a universal approach to complex systems designs.

The conference will have participants from nine engineering societies in the United States and Canada.

The IEEE, a participant in the Joint Engineering Management Conference, will be sponsoring a symposium on nuclear science in San Francisco, Oct. 29-31. The symposium is planned as a broad spectrum professional workshop for engineers and scientists.

Papers will be presented at the meeting by physicists and electronic specialists, doctors of medicine and computer designers. It is expected that the exchange of information between these engineers and scientists of diverse backgrounds will provide a unique contribution to nuclear development.

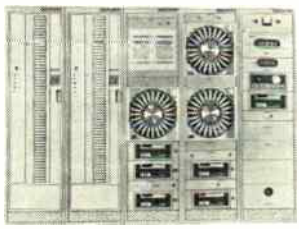
FCC Amendments

Two sections of the FCC rules have been amended in order to clarify the rules and remove inconsistencies.

Section 73.40(a)(6) and 73.47(a)(4) were amended to require that the reference level against which hum and extraneous noise in standard broadcast transmitters is measured be established with a sinusoidal tone of 400 cycles per second.

Section 73.47 has been amended to require that audio frequency response be measured over the range of 50-7500 cycles per second instead of 30-7500 cycles per second.

During Apollo 11, live television pictures of the moon were picked up through a 36-inch reflector telescope at Fernbank Science Center, Atlanta, Ga. using a small Norelco black-and-white TV camera (indicated by the arrow). Standing, center, is Fernbank astronomer Dr. Paul Knappenberger and to his left, Ralph Buice, acting director of the Chattanooga Satellite Tracking Station. Seated is Charles Irvin, systems specialist of Philips Broadcast Equipment Corp. WSB-TV in Atlanta handled the transmission of interviews and moon transmissions from the observatory for NBC.



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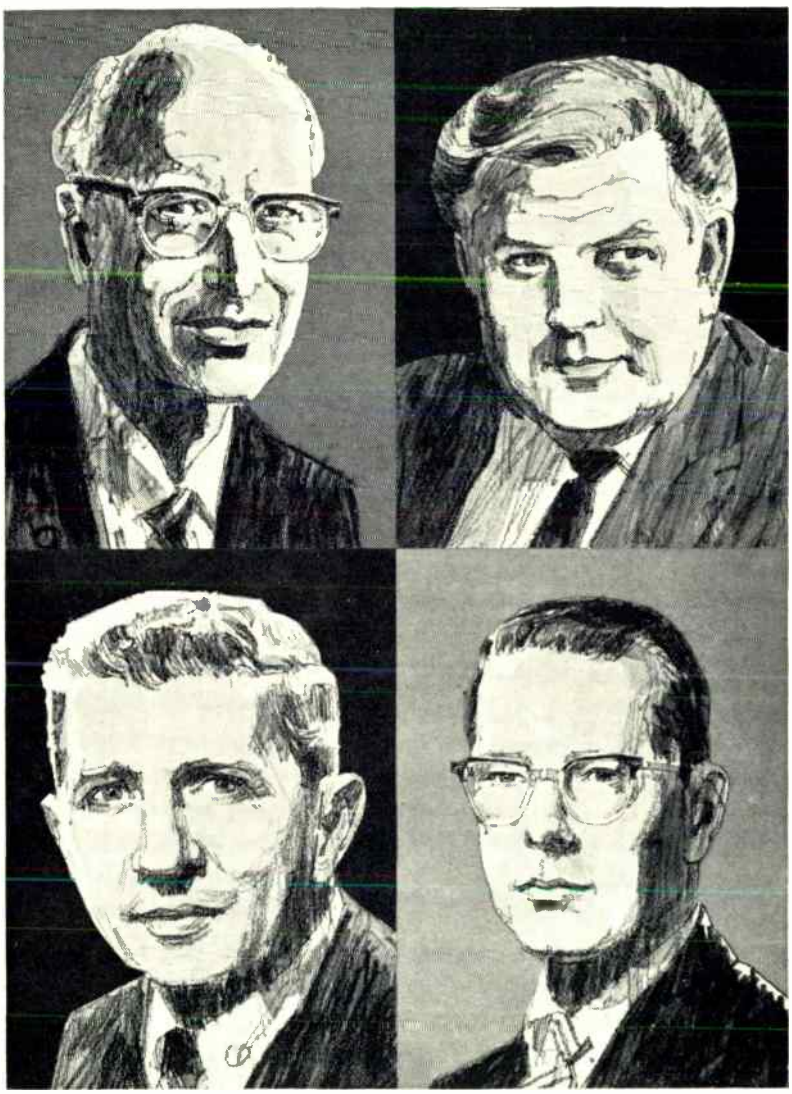

"We're in the 'numbers' now that we have consistent programming quality with our Gates automated system. The numbers help to make our P&L black instead of red." Roger Larson, KARM-FM, Fresno, California

"My best announcers are heard seven days a week! This makes quite an impression on our sponsors who take time to really listen to radio on the weekends." Paul Marion, WBT-FM, Charlotte, N.C.

"We can really maintain the quality 'on-air' sound with our Gates automation equipment. We use only our best people on automation." Phil Sheridan, WNCI Columbus, Ohio

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Engineers and Broadcasters Slate National and State-wide Conferences

The 1969 IEEE Symposium on Adaptive Processes will be held at Pennsylvania State University, State College, Pa. November 17-19, 1969. Papers will be presented on various aspects of adaptive and related processes such as feature extraction and interaction in pattern recognition, identification and estimation, automata models and search and optimization techniques. Applications involving adaptive techniques will be presented in such areas as resign, pursuit trajectory optimization, and digital devices. Special sessions will include invited presentations on current topics of interest in pattern recognition and adaptive and learning control.

OAB Conference

Representative Edith Green (Dem., Oregon) will be the featured speaker at the luncheon held during the 28th Annual Fall Conference of the Oregon Association of Broadcasters. The two-day session will be held Thursday and Friday, October 23 and 24 at the Sheraton Motor Inn, Portland, Oregon.

Other features of the fall meeting, which will draw more than 100 broadcasters from throughout the state, will include a Sales Management Clinic on Thursday afternoon, and election of officers the following day.

During the plenary sessions on Friday, four speakers will discuss programming and other topics of interest to radio and television station owners and managers. Display space with exhibits will be arranged adjacent to the meeting area.

The conference will close with a banquet Friday evening.

Armed Forces Conference

Preparations are under way for the Second Annual Armed Forces Audio-Visual Communications Conference to be hosted this year by the Department of the Army at the Sheraton-Park Hotel in Washington, D.C., November 3-7, 1969.

The meeting will cover topics in applied audio-visual communications, including discussions and exhibits of still and motion picture photography, television, instrumentation, audio-visual research and development, media management and utilization, and career opportunities in the audio-visual fields. The latest developments in audio-visual equipment will also be on display.

Representatives from the Department of Defense and the communications industry will be on hand to examine the latest state-of-the-art in the meetings and seminars. The Annual Audio-Visual, Pictorial, Television and Communications Equipment Symposium will be held at the Sheraton-Park Hotel, November 3-5, 1969, in conjunction with the conference.

NAEB 'Task Force' Chairman Appointed

Dr. Roger Penn, former manager of WAMU Washington, D.C., has joined the staff of the National Association of Educational Broadcasters on a three-month assignment as chairman of a special Task Force on Professional Development Needs. The purpose of the task force is to establish guidelines that will identify priorities for professional development in all important aspects of educational and public broadcasting.

The study, funded by the Corporation for Public Broadcasting, will pinpoint current deficiencies in the field, identify programs which are currently underway to relieve them and make recommendations for additional programs which will assist the CPB and NAEB in formulating new policies for professional development in educational broadcasting.

(Industry News Cont. page 77.)

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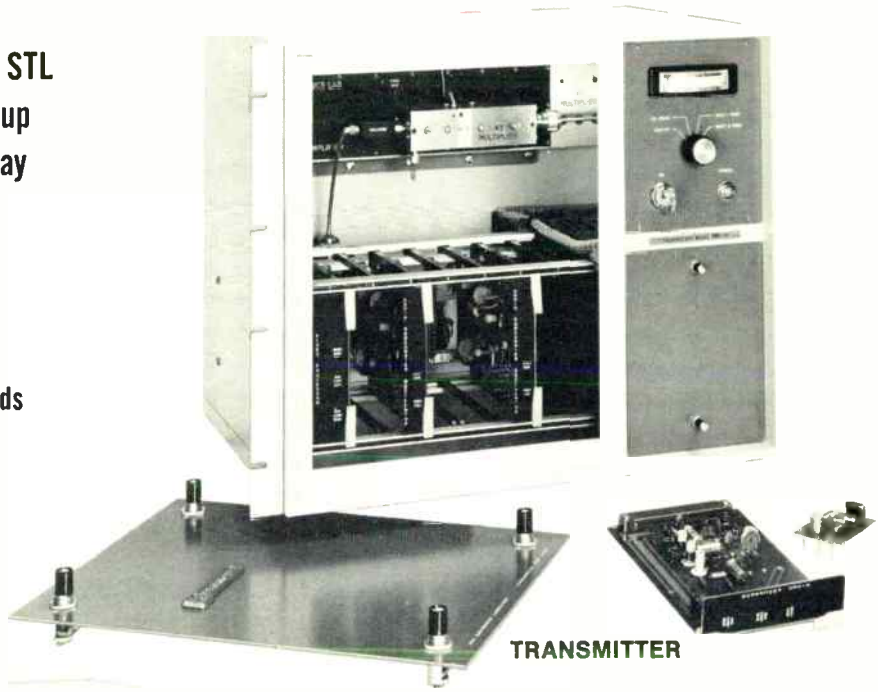

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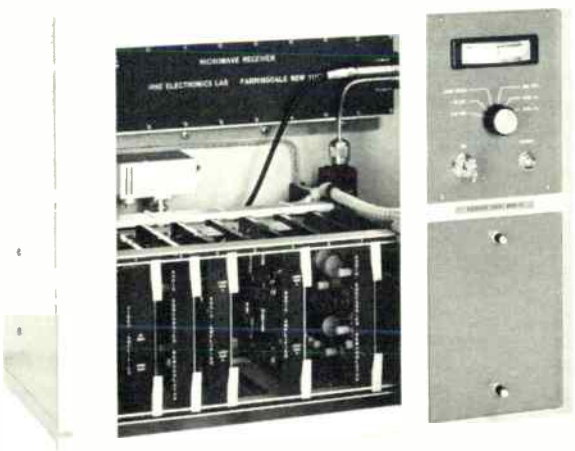

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Circle Number 10 on Reader Reply Card

SCANNING THE CATV SCOPE

By Harry Etkin

Publishers Support CATV

Newspaper publishers from across the country have united against restrictions on CATV and proposals which would prevent CATV/newspaper cross-ownership and have formed the Newspaper Committee for Cablevision. The organizations two basic objectives are:

1. To free cablevision from undue restrictions and to allow it to achieve its great potential as part of the overall communications structure of the nation.

2. To prevent class discrimination against newspapers, or others, from owning cablevision systems in their home markets merely because they are newspaper publishers.

The committee has asked that ownership franchises be granted on individual merits because they feel it would not be in the public interest to have Federal Rules barring publishers, or any other citizen, from operating cablevision in their home towns, as the Justice Department has recommended. The organization feels that local governments can best evaluate the public record of local CATV franchises.

Commenting on CATV's potential, it was stated that: "The policies that are evolved now by the Congress and by the government agencies, will either encourage that development or impede it. We believe the growth of cablevision should be encouraged, and we intend to try to help evolve the kind of public policy that will achieve this end."

FCC Extends CATV Comment Filing Date

The FCC has announced by Report 140.5214 that the time for filing comments and reply comments on various portions of the CATV rule making proceeding (Docket 18397) has been extended by the Federal Communications Commission. Requests for the extension were made by the Association of Maximum Service Telecasters, The American Civil Liberties Union and a number of individual firms.

In his review before the Subcommittee on Communications of the FCC's recent actions in the CATV field, Chairman Rosel Hyde called CATV "one of the most important issues in the communications area."

Referring to the proposals in the rule making proceeding requiring systems in major markets to obtain retransmission consent before they can import distant signals and copyright, Chairman Hyde said it was "a logical consequence of our goal to eliminate unfair competition which otherwise would be present. To do this, it would appear that the UHF station and the large scale CATV operation should both deal fairly and openly to obtain the right to present the TV product."

Manhattan Cable to Originate Color Programs

Manhattan Cable TV Services has become the nation's first cable television system to install professional broadcast equipment for originating motion pictures and other film programs in full color.

When the $80,000 system begins operation, Manhattan Cable viewers will see film programs equivalent in color picture quality with those that the cable now relays from all of New York's TV stations, according to John MacPherson, General Manager.

One of the nation's largest TV-by-wire systems, Manhattan Cable provides 24-hour program service over Channel 6, unassigned for broadcasting in New York, and reaches several thousand households plus approximately 40,000 hotel rooms. Its franchise covers all of Manhattan Island south from a West 79th St. and East 86th St. boundary.

MacPherson said the cable would carry film features, news film and interviews photographed at remote locations—all in color—when the RCA originating system is in regular use.

During the winter and early spring months, Manhattan Cable provided viewers with "live" black-and-white coverage of college and professional basketball games and pro hockey, among other events. These originations were in addition to its off-air pickup and relay of programs, mostly in color, from the 11 New York area stations.

The RCA originating system centers on a four-tube TK-27 color film camera. Motion picture and slide projectors and an optical multiplexer complete the system.

The four-tube camera design by RCA employs in addition to the three pickup tubes normally used for red, green and blue—a separate tube for monochrome. This aids sharpness and detail when signals from the four tubes are combined to form a complete color picture.

For headlines, stock ticker quotations, scores and similar material, a cable system is used which converts typed information and symbols into a TV signal without the use of a camera. The system was widely used in reporting election returns.

CATV New Product Report Grows After Cable Convention

With cable prospects looking better, the list of new products is growing. In an effort to keep up with this growth, we are starting CATV new products here and continuing them on page 56.

New all-weather TV drops have been introduced by **Comm Scope.** The drops are available in conventional, dual and dual IM constructions. The center is a .032 copper-covered conductor with 30% conductivity. The drops are available with expanded polyethylene dielectric for aerial constructions or solid natural polyethylene dielectric for direct burial constructions.

The inner shield of aluminum-mylar laminate is longitudinally applied with overlap and a Water-Bloc compound between the inner and outer shields. The outer shield is of helically wrapped corrugated aluminum-mylar in either black or beige polyvinyl chloride for aerial construction or polyethylene for direct burial constructions.

Circle Number 65 on Reader Reply Card

Program Switcher

The Essex Model 1619 Automatic Program Switcher, which carries a two-year guarantee on all parts used under normal conditions, is now available from **Eessex International, Inc.,** Controls Division.

The CATV program switcher consists of a time base (1619A) and two program boards (1619B & 1619C). A 1619B is used for the first channel requiring non-duplication protection, and each succeeding chanel (up to 6) is handled with the 1619C. When the channel protection requirements are seven channels or more, a power base is easily added.

The program board is designed to provide switching information at ½-hour intervals for an 18-hour program day, covering a seven-day period. The 1619A time base, which provides the basic timing mechanism required by the program board, utilizes a precise cycle timer. Set for operation at 117 V, 60 cps., this is the timekeeping unit which NASA has used as a timer aboard all manned space satellites.

NAB Directors Adopt Resolution On CATV

The Board of Directors of NAB has adopted the following resolution:

A. Free broadcasting and CATV are necessarily related because of the dependence of CATV on the use of free broadcast signals so as to best serve the public.

B. Federal regulation of the two industries should recognize this relationship and seek to harmonize the public's interest in the orderly development of the primary, free, local and area broadcast service and in the legitimate development of the important but supplementary CATV service.

C. A negotiated settlement of existing differences involving all parties of interest, including free broadcasting, CATV, and copyright, would, if consistent with the public interest, provide a useful guide for Congressional action.

D. The staff of the NAB has participated in discussions with staff representatives of NCTA and these discussions have resulted in a list of specific proposals delineating some of the important aspects of the relationship between free broadcasting and CATV.

The unit will operate continuously for approximately one month on standby power from readily available 9-volt transistor batteries. The timing accuracy is the same during standby power periods as during 117 V operation; therefore, immediate return to the split-second, pre-set sequence is insured when 117 V power is restored.

Circle Number 66 on Reader Reply Card

TV Camera

An ultrahigh-resolution television camera, capable of a 2,048 line 30 Hz frame rate has been developed by **General Electric's** Electronics Laboratory. This new era has a bandwidth exceeding 40 MHz.

A 1½-inch focus projection and scanning (FPS) vidicon tube, used in this camera system, employs magnetic focus and electrostatic deflection. This focus and deflection combination is superimposed in the same volume, rather than in a sequential fashion.

In applications requiring higher-resolution performance at flicker-free scan rates with a change to an amplifier bandwidth in excess of 80 MHz, the 1½-in FPS camera system will operate with equal horizontal and vertical resolution on the order of 1600 TV lines.

Circle Number 67 on Reader Reply Card

TV Camera System

Philips Broadcast Equipment Corp. has announced a new multi-purpose TV camera system which accommodates the new one-inch Plumbicon pick-up tube. This system has been designed specifically for universal applications in education, broadcasting, science and industry. When combined with a 6½-inch electronic viewfinder, a Pan/-Tilt unit and zoom lens, the multi-purpose system also serves as a low-cost studio camera chain, the heart of local-origination operations for the CATV operator.

Options in the system include a choice of Plumicon or vidicon camera heads, and either 1-inch or 30mm diameter pick-up tubes for either. This flexibility permits selection of an optimum sensor for each portion of a multi-camera system television system while retaining a single choice for the control unit. The control units are available in cabinet or rack-mounted models.

The Philips multi-purpose system operates from a 100, 117, 220 or 234 volt power source. Modular plug-in techniques are combined with the latest circuit developments.

One set of available parameters include switchable operation at 525-line/60-field and 625-line/50-field or the system may be obtained to operate at 735-line/60-field and 875-line/50-field.

The camera chain is equipped with an intercom system between the camera and the control unit. An additional connection is available at the rear of the CU for interface with a switcher/fader if required.

Circle Number 68 on Reader Reply Card

EDUCATIONAL BROADCASTING

Looking Inside Non-Commercial Broadcasting

By Mike Smith

One of the grey areas where technical and operational responsibilities frequently overlap is that of video tape labeling. The tape program label necessarily bears information which contains both engineering and program data. Engineers have had such problems with inadequate program labeling that the Society of Motion Picture and Television Engineers has adopted RP-26, "Label Specifications for 2-in. Quadruplex Video Magnetic Tape Recordings."

RP-26 specifies that a label should be affixed to both tape reel and storage container and that it should contain the following information:

1. Name of company or studio
2. Name of program or commercial
3. Number of program or commercial
4. Modulation practice—high band or low band
5. Color or black and white
6. Original or copy

Best Label Size

Selecting a label size is the first problem. A label should be large enough to contain all of the information specified by RP-26, and more. But it must be small enough to fit on most reels of tape between the air holes. If the reel label and the container label are two different sizes, the printer will look at them as two different jobs. But, if both labels are the same size, and contain the same copy, the printer see only one large job, and the unit cost per label will be lower. Additionally, if the reel label and container label are identical in size, and made of the right kind of paper, carbon paper can be used to make both labels with one effort at the typewriter. Therefore, it is logical to shoot for one label which will fit both shipping container and reel.

Figure 1 is a full size reproduction of a label with nearly ideal dimensions. It measures 2″ by 5″, and can be cut from stock paper sizes without an expensive waste of unusuable gutter. Dimension A in Fig. 1 (5″) will fit on video tape reels currently supplied by Memorex, 3-M and Ampex which are 8″ or more in diameter. By carefully designing the layout of the label so that all of the essential information is kept within dimension B (2 9/16″), the logo and address can be snipped off to leave a label which will fit most of the smaller spot reels as well. The address portion can then be placed in another portion of the reel surface, and the logo can be discarded. The full label can be applied to the case without modification.

A second problem area involves selection of paper stock. Hard finish or glossy paper stock looks nice, but will not absorb ink or typewriter impression well. When the essential information is smeared and illegible, it is useless. A porous or woven paper is desirable. If the labels are exposed to rough handling in shipment, they should be made from a tough, fibrous paper such as Avery Tigerhide.® Selection of adhesive to make the label stick to the reel and container is also important. Water activated gum labels will not adhere to metal reels and plastic containers. It may seem ridiculous to even mention the possibilty, but this error has been made. Non-permanent adhesives on pressure sensitive labels are not desirable. After a few days, most labels of this type are just as difficult to remove as those with permanent adhesives. After a longer period of time, this type of label tends to curl at the edges,

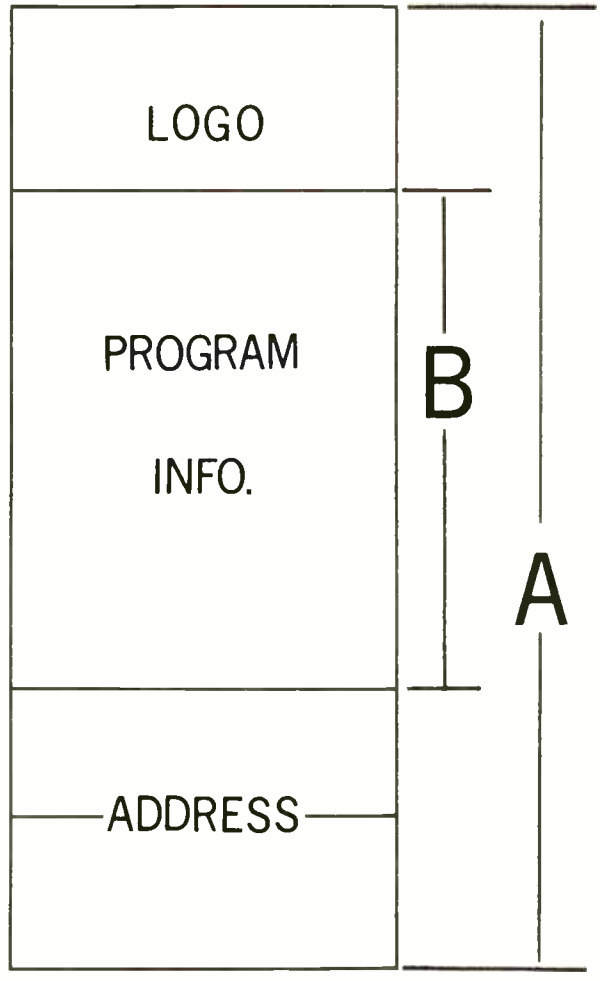


Fig. 1

especially when they are on another paper or a fiber surface. This curl exposes a tacky underside and looks bad. A good permanent adhesive label is the best bet.

Use of colored paper stock with the same printed information can be a tool for immediately flaging a master recording. A whole color coding system can be developed for special categories of tapes at a slight increase in printing cost, since the same printing plates can be used.

Labels printed in sheets like those shown in Figure 2 make for more efficient production in the typewriter. Performations between the labels, however can present a problem. If the performations are made through the paper, adhesive and backing, thousands of the little punchouts from the perforations tend to cling to the labels. Without fail they find their sticky way into expensive head assemblies and onto the oxide of good tape stock. The labels in Figure 2 were trimmed and the gutters between the labels were removed together with the adhesive before perforation. In this process the punchouts go through the backing without adhesive on them, and the very few that cling to the labels on delivery from the printer disappear before they are out of the typewriter.

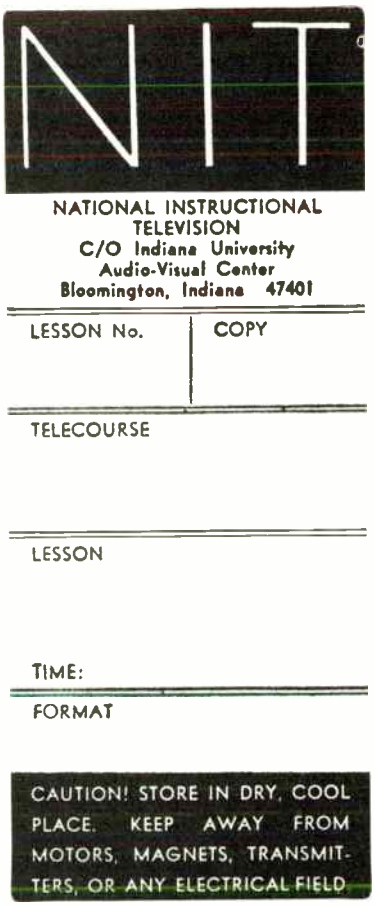


Fig. 2

Video recordings can be made in 6 different quadruplex formats. That is, high band monochrome, high band color, and low band monochrome at either 7½ or 15ips. One system for specifying format on a program label is the box method, where a box and descriptive line are printed for each possible recording format. The appropriate box is then checked off by the engineer at the time of the recording. This method works, but uses valuable space which could better be used for wordy titles or special notes. A simple line in which the expression "15 ips HBC," or "7½ ips LBM" is entered can eliminate the waste of space. Use of the longhand phrase can also help to avoid errors which are easily made by checking off or reading the wrong box.

Each station will have its own peculiar needs in a program label. These consideration are simply intended as a helpful starting point.

RFE's master control system

By J. R. McDonald, Jr.
Deputy Dir., U.S. Army, Europe MARS Program

■ Radio Free Europe, known to most Americans as a big radio station that broadcasts to eastern Europe, has grown over its nineteen-year history much like many Stateside broadcasting organizations. Its growth, while rapid, has not been marked by haywire engineering or hastily contrived makeshift projects.

The keynote of RFE's engineering program has been to thoroughly assess engineering requirements and fill them as quickly as possible with the best possible equipment and engineering practices. This has led to the development of RFE's house-designed and built master control system. Completed in 1965 at a low cost of $12,000, the system was designed to provide reduction of extra personnel, partial automation, virtual elimination of production errors, fail-safe circuitry and minimum component maintenance and downtime. In its four years of heavy usage, it has provided these features most satisfactorily and reliably.

In its 19 years of operation, Radio Free Europe has grown from a single 7,500 watt transmitter in a truck to a 32 transmitter system broadcasting from three sites in West Germany and Portugal with a total power of 2,245 kilowatts. All systems are linked together and fed from the main operations center at Munich, Germany.

A separate audio feed in each of the five languages is sent to select transmitters from the Munich headquarters, making it necessary to control five separate programs in the studios at one time. Because each language is programmed by its own department, control room coordination is difficult. The master control system, however, provides centralized audio and switching control.

A unique feature of the system is that, essentially, the traffic department not only determines the program continuity but actually operates the switching equipment. This is done by a teletype tape punched in accordance with each day's program schedule for each program. These tapes are prepared along with the program logs and sent to master control each morning where they are threaded on teletype tape-readers mounted on the front of the selector panels . . . one for each language program.

Each tape selects the first program source (live studio, news booth, tape playback) and then moves on to the next program source while the first source is being aired. It prepares the system for the next event which is then triggered by an OFF signal from the first source. This signal is given either by OFF buttons in the studios and news booths or by a cue tone on a playing tape. The selection cycle then repeats itself, arriving at the source which the tape reader has previously selected.

As soon as this cycle is complete and the new source is on the air, the tape reader moves to the third source and prepares the system for that selection. This cycle repeats itself throughout the day, arriving at whatever source has been punched on the tape. This effectively reduces manual switching to presets at the beginning of the day and periodic tape machine setup and sequence selection.

When the tape reader has set itself on the next source to be aired, a "stand by" tally light appears on both the selector panel in master control to indicate that the selection has been made and in the selected

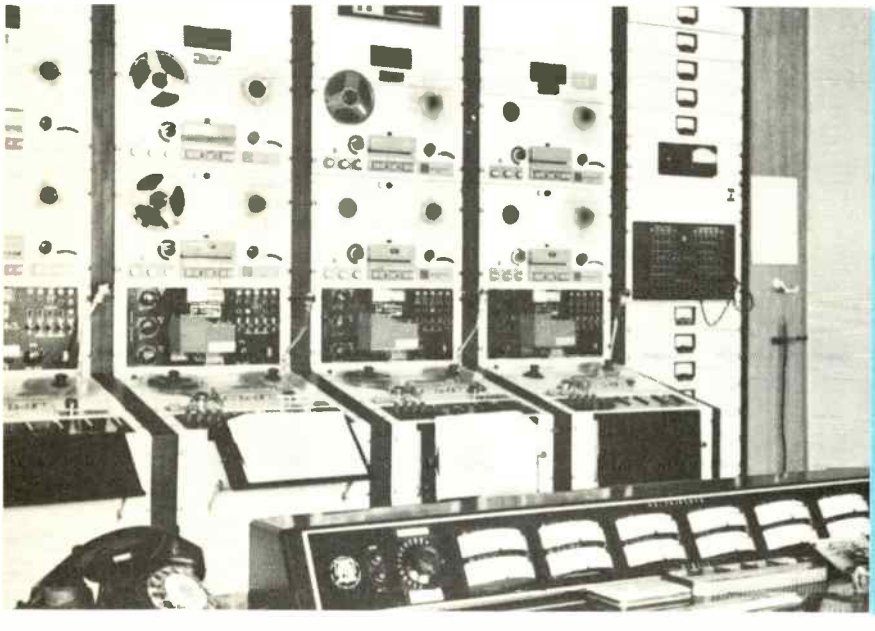


Fig. 1 Master control system has all but eliminated jack fields. The only one left is shown at far right in foreground and is for metering of all transmitter feed lines.

studio or news booth to let the announcer there know he's next.

Along with the appearance of the "stand by" light, an alarm is set. The alarm will sound if the source is not ready at air time. Readiness is indicated by the announcer at the selected studio or news booth pressing a "ready" button on his console, which lights a "ready" light on the selector panel in master control and disables the alarm. Thus, the supervisor in master control can tell at a glance which source is next and whether or not it is ready by observing the "stand by" and "ready" tally lights on each of the five selector panels.

When the OFF signal is given from the prior source, the new source is selected and an "on air" tally light appears on the selector panel and on the selected console. This is the announcer's cue. If a tape machine has been selected, it starts. If the "ready" tally light has not been lit by the announcer's button or by threading of the selected tape, the alarm rings. If it's a news booth that has been selected but is not ready, the alarm rings in the news department. Each time a studio or new booth is used, the "ready" button releases, so it must be depressed each time that source is to be used. This prevents its being left depressed all day and giving false "ready" signals.

The master control room is also the location of the central tape playback facility. This frees the operators and announcers in the studios to prepare and perform their programs without interruption. Each language has a bank of three reel-to-reel tape playback transports plus two cartridge players that can be added to any bank. Each machine has its own RFE-designed transistorized playback preamp and each bank is connected into a tape sequential selector unit which can automatically sequence the three tape players in its bank in any predetermined order.

The sequential selector also provides for the addition of one of the

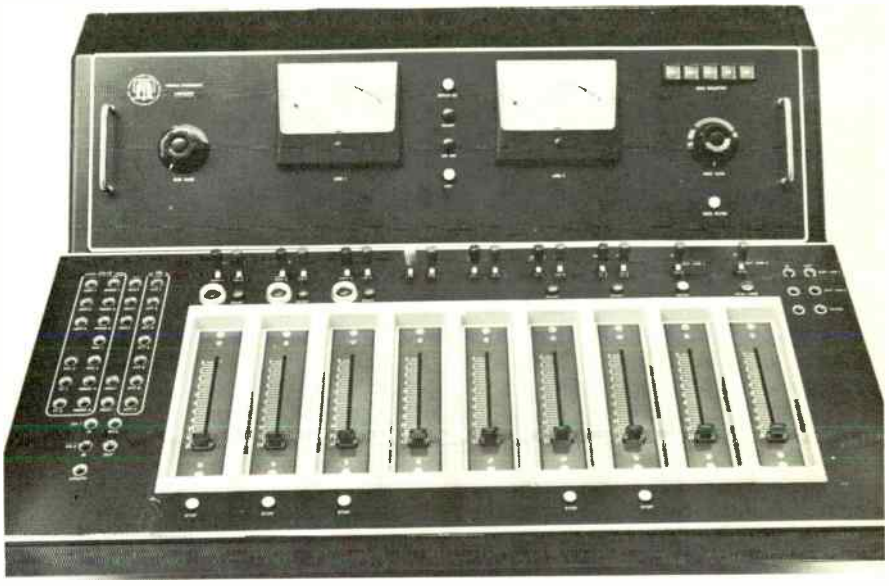


Fig. 2 REF's studio console.

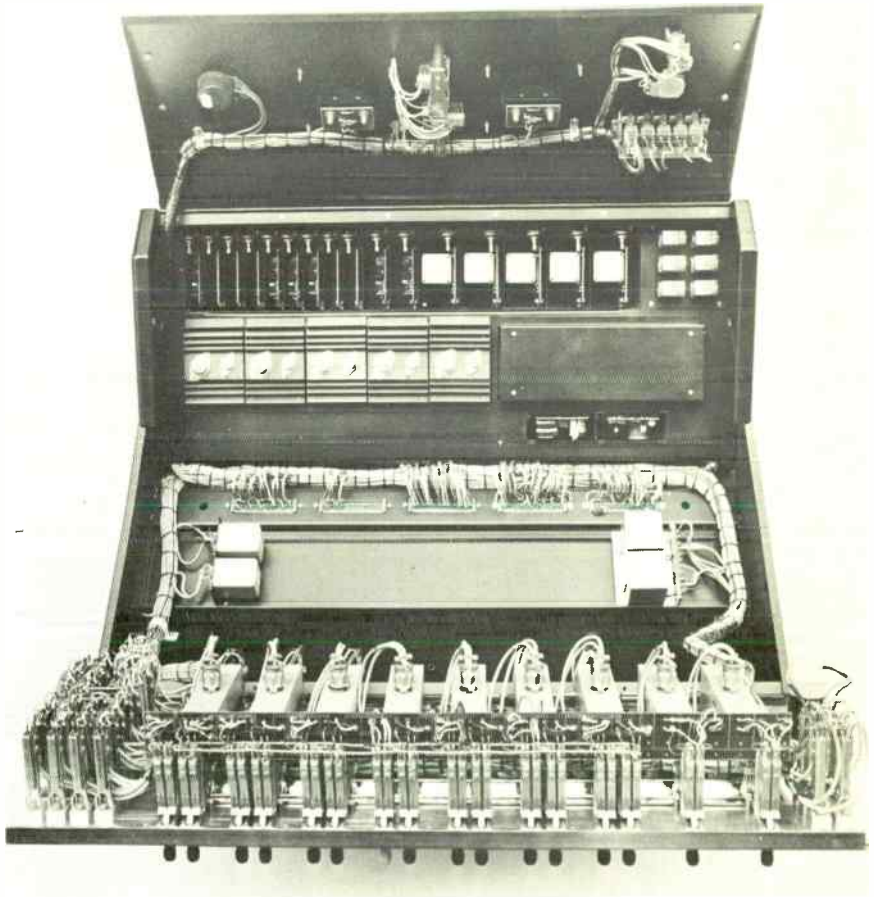


Fig. 3 Back view of console with hinged access panels allowing maximum room for maintenance.

tape cartridge players to any bank. The cartridge player can then be included in the playing order. For example, if a program is on three tape reels and a cartridge, the reels are threaded on the players in the proper bank and the cartridge inserted into the desired machine. The sequential selector buttons are then depressed in the proper playing order. If the order is transport 3, transport 1, transport 2 and cartridge, the third button from left on the top row will be depressed, as will the first, second and fourth buttons on the second row. The four rows of four buttons each provides the variable sequencing as the selector works in a similar fashion to the "level-hunt" system in dial telephone exchanges. It hunts from left to right, top to bottom.

As each transport plays, its selector button is magnetically released, thus preventing automatic reselection of the first transport after the last one has played. This allows the OFF signal to be sent to the automatic program switcher, allowing it to select the next program source. Like the automatic program switcher, the tape sequential selector has complete manual override in the event of automatic control failure. It also has an alarm which sounds if a transport is selected but not cued or threaded or if a tape breaks while on the air.

The tape playback machines are also automatic. Once the tape is placed on the machine and threaded, it is only necessary to press the start button on the machine to cue the tape. The machine will run until the first modulation passes the playback head, then it will stop, back up about 8 inches and stop again with the tape properly cued. At the conclusion of a program, the machine will stop and automatically rewind the tape then stop when the reel is completely rewound.

RFE's needs are somewhat specialized and often a commercially built piece of equipment will not fulfill their requirements. The master control system, precisely tailored to their needs, is one example of RFE's approach to engineering and production equipment. This approach has led to the design and construction of many other pieces of equipment, such as the studio consoles and remote consoles for the far-flung news bureaus, the house monitor system and many power supplies, high-power transmitter combining diplexing and switching systems and specialized antenna systems.

As RFE's engineering department puts it, "We'll design and build our own equipment if a commercially available design won't fit our needs, if we can build it less expensively or if we can build it with better quality than commercially available equipment." With its many specialized needs, its sense of engineering economy and efficiency and its knowledge of state-of-the-art technology, RFE will undoubtedly be designing equipment for some time to come. □

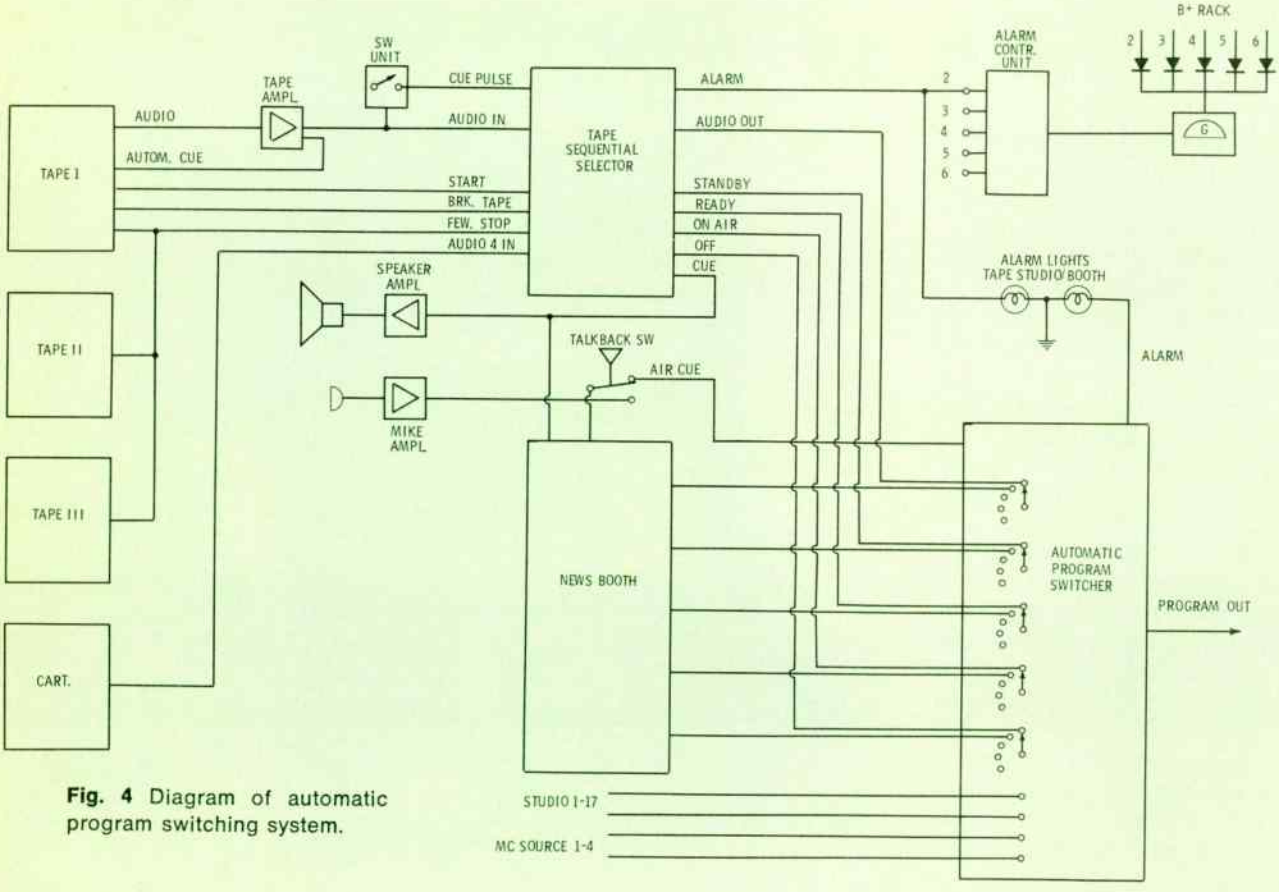


Fig. 4 Diagram of automatic program switching system.

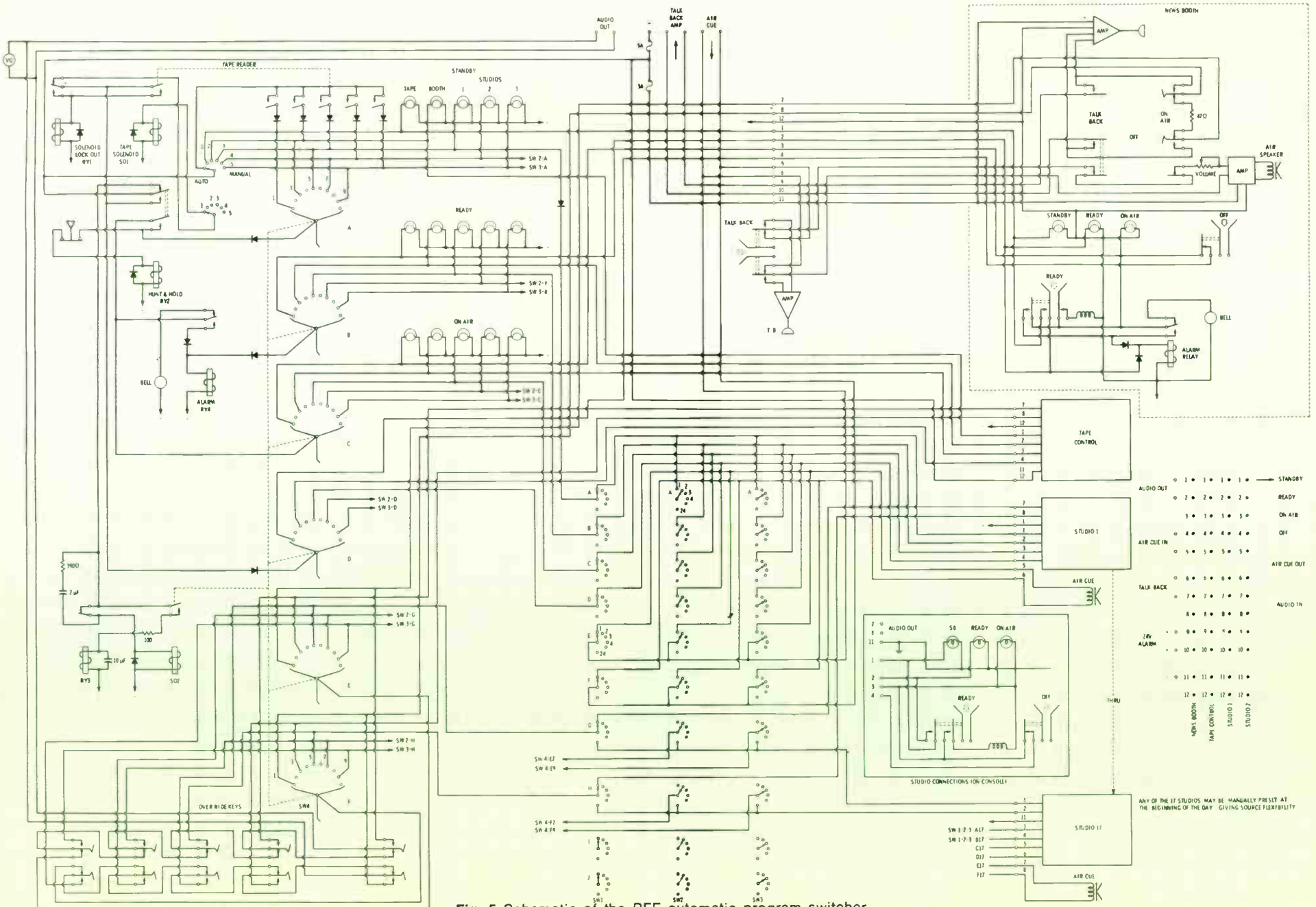


Fig. 5 Schematic of the RFE automatic program switcher.

The switch-hitters

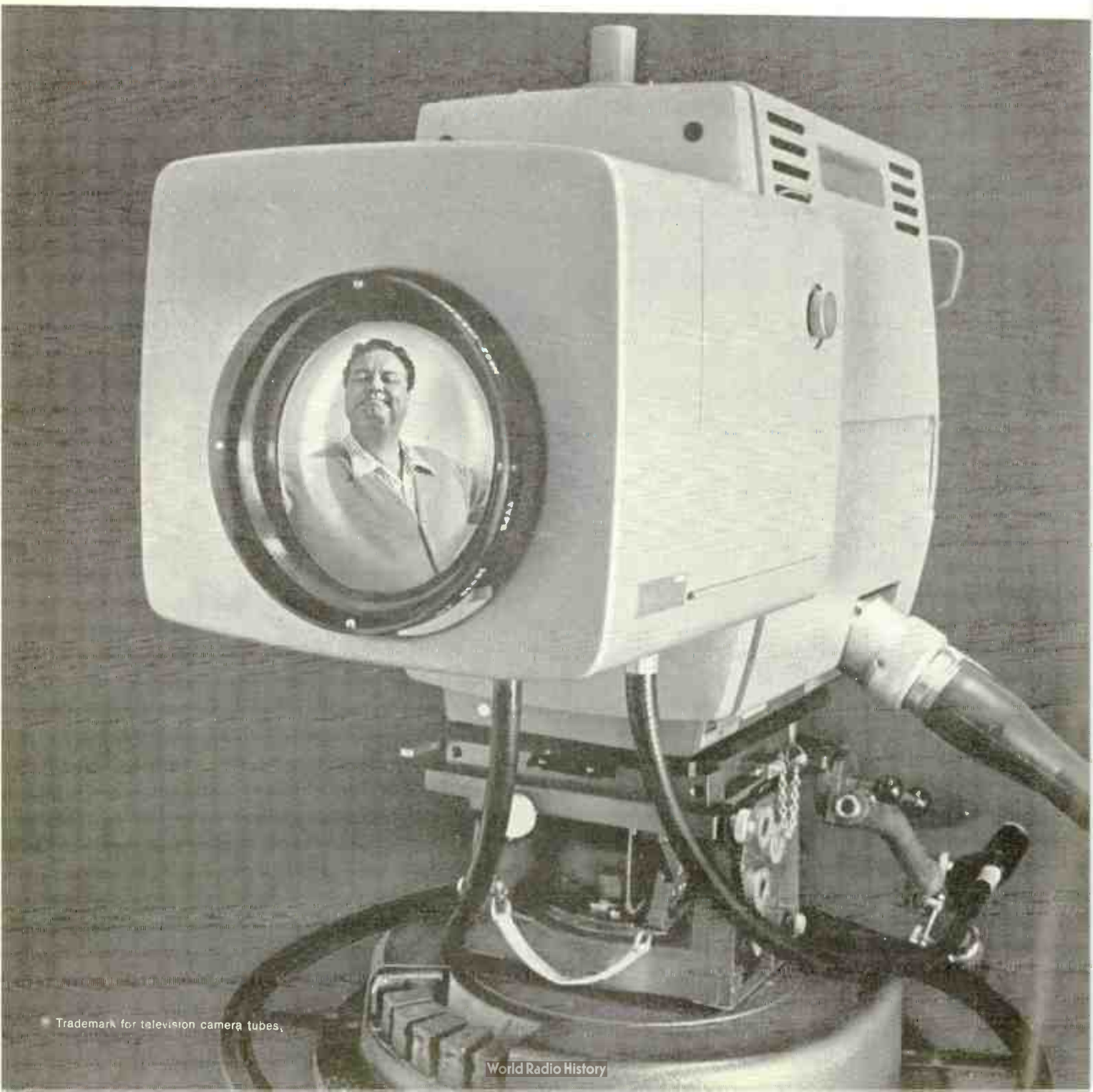
THE PHILIPS PC-70... the prime time king of color cameras... serves on more live and taped studio color shows, by far, than any other camera.

And it's a fantastic switch-hitter. If the PC-70 is a winner in studio work, in the field it's no contest. For major outdoor news and sports events, the PC-70 consistently takes the most valuable player award.

Why? Its unsurpassed color picture, faithful and sharp. There are over 700 Philips 3-Plumbicon® cameras in use worldwide. A videoman's dream. The cameraman's camera. Management's assurance of the best, most reliable, and most economical performance.

When a better camera is built, Philips will build it.* In the meantime, the PC-70 is the ticket.

*The Philips PC-100, announced at NAB '69, will be available early in 1970.



® Trademark for television camera tubes.

THE PHILIPS PCP-90 digitally controlled "Minicam" takes the field alongside the PC-70 as the most mobile and versatile of portables. Operating wireless or on small, cost-reducing triax, the 3-Plumbicon Minicam brings total flexibility to broadcast-quality telecasting.

The PCP-90 is designed basically as a field camera. Controls may be beamed from as far away as 30 miles. Signal processing is done in the backpack. The Minicam produces a real-time color-composite signal for direct broadcast. Or it can go into the field with a portable recorder to tape interviews or other action—totally unencumbered.

And here again, you have a star switch-hitter. Three new one-inch Philips Plumbicon tubes perform to broadcast standards, bringing the Minicam right into the studio.

Training camps for Minicam prototypes included crowded conventions, major sports, the inauguration and other events. Now it's ready to sign with you.

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A NORTH AMERICAN PHILIPS COMPANY

TV applications for IC

Part 1 of 3 parts

By Walter Jung*

*Senior Engineer, MTI, a Div. of KMS Industries.

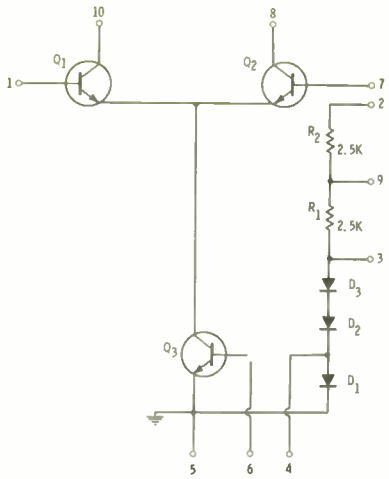

Fig. 1a Schematic and pin configuration for IC differential amplifier LMX71 (LM171, LM271 and LM371).

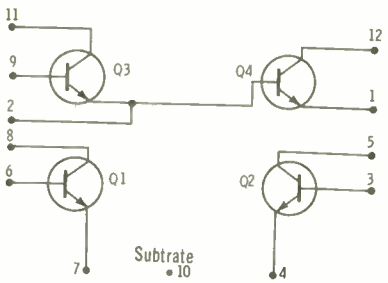

Fig. 1b Schematic and pins for IC transistor array CA3018 and CA-3018A.

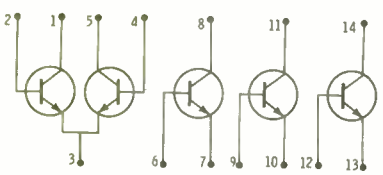

Fig. 1c Schematic and pins for IC transistor array CA3045 and CA-3046.

One of the most versatile circuit configurations in existence is the differential amplifier or emitter coupled pair. It's almost limitless uses include amplifiers, oscillators, switching circuits and a myriad of other applications bounded only by the ingenuity of the user.

Until the advent of monolithic integrated circuits, a high quality transistor differential pair with the necessary matched parameters was a costly item usually avoided except for the most stringent applications. (4) But the appearance of a versatile class of devices, configurated as emitter coupled pairs, and generally termed "RF-IF Amplifiers" has opened the doors to economical and extensive use of differential amplifiers.

The monolithic processes under which these devices are made yield highly desirable DC characteristics which together with the unparalled flexibility of the basic configuration suggests uses in many other categories. This article will attempt to illustrate the flexibility and advantages of various applications using the monolithic differential amplifier, with a variety of circuits tailored around TV circuit use.

Advantages of IC Differential Amplifiers

These monolithic devices have several distinct advantages when considered as a differential amplifier pair. The DC characteristics mentioned above include matched Vbe (within a few millivolts), matched DC Beta (within a few percent), and a low temperature differential between circuit elements due to the close physical proximity. Since the devices are advertised as amplifiers, or gain blocks, biasing is built in and a current source provided to establish the static emitter current of the differential pair. Sufficient flexibility to connect the device in a variety of ways is provided by the lead configuration, which allows access to the circuit nodes. With these DC characteristics and the small geometry high Ft transistors utilized, it is obvious that the unit is a well designed DC amplifier pair using high frequency transistors. Its applications should (and do) include DC through hundreds of megahertz.

The schematic and pin configuration of a device under discussion is illustrated in Figure 1a. The differential pair is Q1 and Q2. Both the base and collector terminal of each transistor is brought out external to the package, allowing these terminals to be connected in unrestricted fashion.

The common emitter terminals of Q1 and Q2 are connected to the collector of Q3, a constant current transistor. Q3 is biased by jumpering pins 4 and 6 external to the package, placing its base-emitter junction in parallel with D1. By forcing a current through the D1-D3 diode chain from the positive supply, D1 will exhibit a terminal drop proportional to this current. This voltage is impressed across Q3's base emitter junction via pins 4 and 6, causing a similar current flow in Q3's collector, and thus through Q1 and Q2.

Due to the unique matched parameters of monolithic transistors, the current conducted by Q3 will be very near equal to that of D1 (in actuality a diode connected transistor identical to Q3) over a fairly wide range of operating currents. (6)(7) (11) By varying the current through the diode chain, indirect control of the Q1-Q2 emitter current is achieved (3) (5). Several options of diode current are available by connecting either one or both of

differential amplifiers

the 2.5K resistors to the positive supply (normally 12 volts). In addition, the top of the diode chain is brought out via pin 3, which results in a convenient bias point for either or both bases of Q1-Q2 in some applications.

Many variations of bias configurations are available, but this is the basic and most simple scheme. Additionally, monolithic transistor arrays such as those shown in Figures 1b and 1c can be utilized, using similar bias techniques. (22) Examples using all of these devices will be illustrated in subsequent circuit descriptions.

Amplifier Circuits

The difference amplifier is the fundamental amplifier circuit on which all discussion will be based. It is shown in Figure 2a.

Q1 and Q2 amplify the difference between the input signals e1 and e2, with a high degree of supression of common mode signals such as hum, noise, etc. This is an extremely useful factor which allows operation on long signal lines from remote signal sources which would normally be unusable. Chassis potential differences in large systems typically generate significant common mode voltages which are easily suppressed by a circuit of this type, while still amplifying the desired signal.

Two circuit examples are shown in Figures 2b and 2c. Circuit 2b is an AC coupled difference amplifier using single supply biasing. Figure 2c is a direct coupled, split supply amplifier. Direct coupling and the dual supplies allows the input terminals to operate around DC ground potential. In this amplifier, the negative common mode range is extended to within two diode drops of the negative supply, because current source element Q3 can operate at very low collector-emitter potentials (O Vcb) (6) (12). With Q3 at O Vcb, the minimum emitter voltage of Q1 or Q2 will be one diode drop above -V (Q3's base potential), which places the bases of Q1 and Q2 two diode drops above -V. This type of current source, peculiar only to monolithic devices such as this, is most efficient and allows maximum utilization of supply potentials.

Voltage Follower

An example of how this factor is turned to useful advantage is illustrated by Figure 3a, a high output swing voltage follower.

The combination of Q1-Q2, Q4 and Q5 comprise an operational amplifier connected in a unity-gain, non-inverting condition (voltage follower). In such a connection, the output signal must always follow the input in a 1:1 relation over the full dynamic excursion of signal swing. In this circuit, several features contribute to an ability to do just that; follow the input signal to peak levels almost approaching the + and — supply potentials.

Two diametrically opposing common emitter stages on the output (Q4, Q5) allow operation to within the respective Vce Sats of the two devices. This factor allows (potentially) swings to within a few tenths of a volt of the + and — supplies.

Line regulation is almost entirely dependent on the reference diode, since the current regulating action of Q4 does not allow input variations to pass through the amplifier via the supply. For critical applications, the current feed to D1 would like to be maintained constant for best stability. This can be done by returning Rz to the output side of the regulator rather than the input (see notation on schematic), providing a constant current feed without an active transistor. The drawback is that the regulator will now need to be "started", to reach its operating bias. A simple starting circuit can consist of a resistive

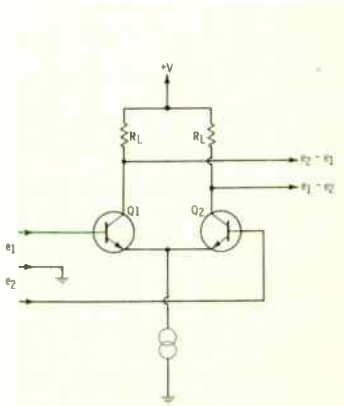

Fig. 2a General difference amplifier.

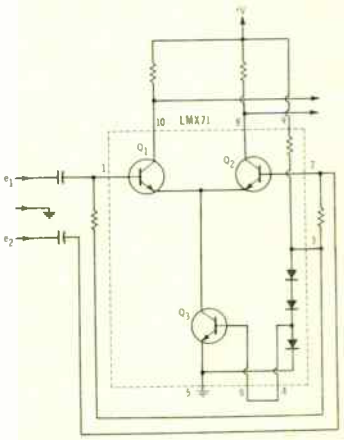

Fig. 2b AC coupled, single supply difference amplifier.

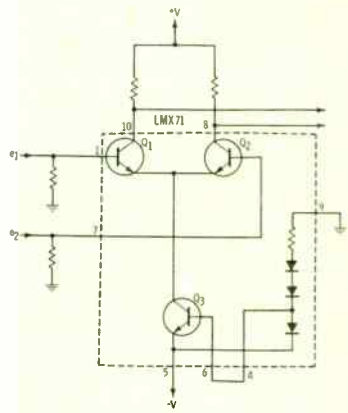

Fig. 2c DC coupled, dual supplies difference amplifier.

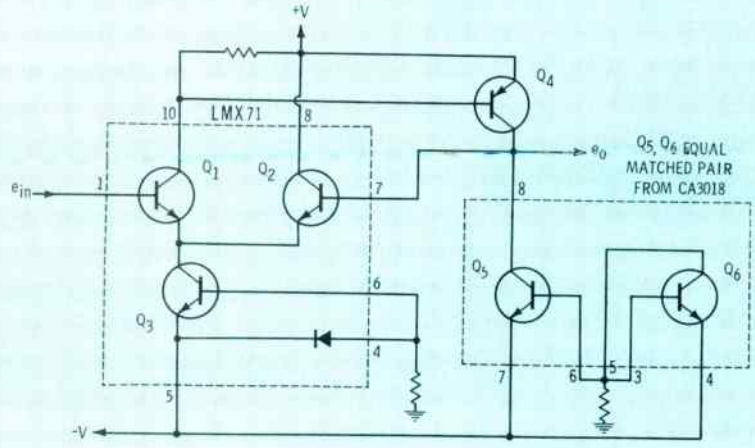

Fig. 3a High output voltage follower.

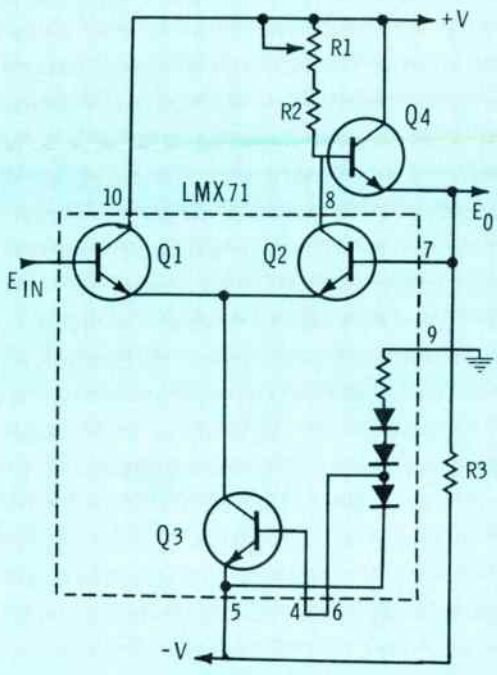

Fig. 3b Low level voltage follower with offset null. Adjust R_1 to zero offset between input and output. Total resistance of $R_1 + R_2$ should pass ½ total current of Q3 in static condition.

shunt across Q5 (shown dotted in the figure as R shunt) which will "pull up" the output until the regulator can take over and maintain its specified potential. This technique has the disadvantage of requiring a minimum load current (Q5 cannot be allowed to turn off, or the regulator will lose control) but in a practical circuit this is usually of small consequence.

It has already been shown that the input stage can tolerate negative swings to within two diode potentials of the negative supply. On the positive excursion the limit occurs where Q1 approaches saturation, and this is approximately one diode drop below the + supply line. Thus, the configuration forms a very wide swing voltage amplifier, suitable for buffering high impedance sources and transforming to lower impedance levels. This configuration is capable, with proper design, of high speed operation due to the high frequency devices used for Q1-Q2.

An inherent characteristic of this circuit is the low offset voltage between the input and output terminals. In this circuit case it amounts to essentially the offset voltage of IC, which is typically less than one millivolt.

Another circuit example is Figure 3b, a voltage follower for low level signals. By balancing the collector currents shared by Q1-Q2, the already small offset between input and output can be reduced to zero or some smaller fixed value if desirable. This is accomplished by the variable collector load for Q2, R1-R2. Q4 is an emitter follower to provide a low impedance output.

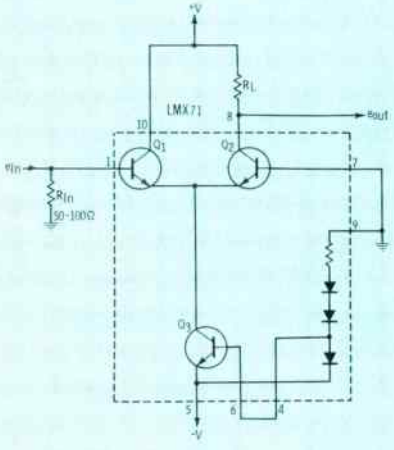

Fig. 4 General purpose video amplifier.

Video Amplifiers

Figure 4 depicts a wide band video amplifier configuration. Although use of the LMX71 in this configuration has previously been discussed by Hirschfeld (3) (5) (14), the advantages offered by a monolithic differential pair for video amplification bears emphasis because of the unique applicability.

Component designs for video amplifiers are usually characterized by a battle with several issues; unavoidable circuit capacities, device gain—bandwidth product (with attendant expense), Miller effect and other compromising factors. It is interesting to note that the monolithic differential amplifier provides a unique but economic solution to these problems.

In the circuit example, the combinations of low input capacity, absence of Miller effect in Q2 due to operation in the common-base mode and the high inherent Ft of the transistors yield a frequency response well up into the megahertz region. In addition, the block gain and 3 dB bandwidth are easily manipulated by various R_L values and control of Q1-Q2 emitter current. Thus, a rather simple device yields a solution to selection of high gain, wide bandwidth video gain blocks with highly predictable properties. The cited references give excellent design information for tradeoffs between gain and bandwidth variations versus various values of R_L and supply voltage.

Voltage Regulator

An NPN differential amplifier such as the LMX71 lends itself well

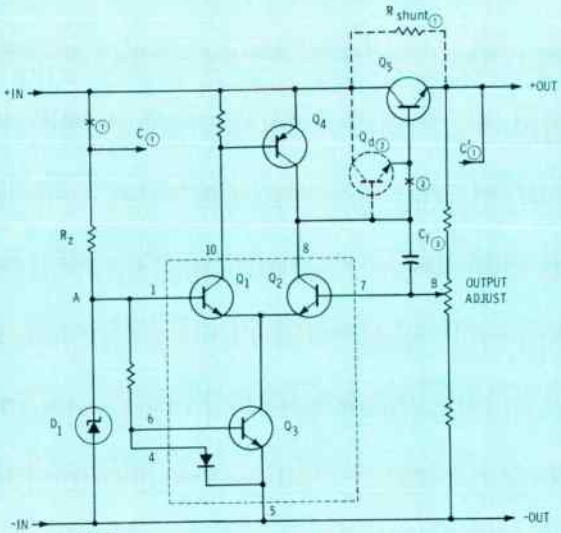

Fig. 5 Power supply voltage regulator.

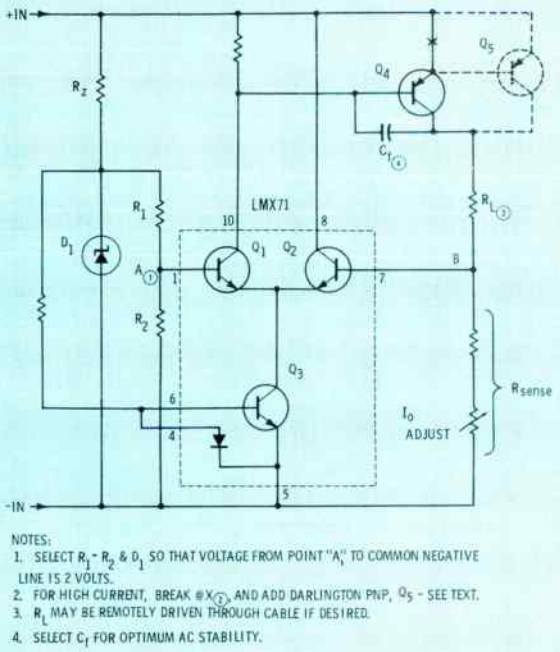

Fig. 6 Current regulator.

to power supply control amplifiers for positive leg series regulators. Coupled with a stable reference diode, low temperature coefficient regulators can be designed, due to excellent inherent DC stability of the differential pair.

Figure 5 is an example of a power supply voltage regulator. The difference amplifier compares the reference voltage developed at point A with a portion of the output voltage sampled by the resistive divider at point B. Q5, the series control element, is driven by PNP amplifier Q4. By using Q4 in this manner, excellent rejection of input variations is obtained (13). Since Q4's base is fed from a current source, input voltage variations will not be amplified, because there can be no changes in the Vbe. As a result, very little ripple appears on the output. Line voltage variations also have little effect, for similar reasons. An extremely high voltage gain can also be realized with this simple configuration, as the gain is proportional to the load impedance, which in this case is βQ5 R_L.

Although this regulator circuit is not unduly complex, it can easily achieve good regulation figures. A .5A, 12 volt regulator of this configuration measured .1% load regulation, a respectable figure. Even tighter control can be achieved by Darlington connecting an NPN driver to the base of Q5 which allows a higher open loop gain to be realized, which in turn lowers the output impedance.

Current Regulator

Although the differential amplifier pair is quite common to power supply voltage control amplifiers, this monolithic variety is very applicable as a current regulator because a very low reference voltage can be used, as low as 1.8V. (12) The technique utilized is illustrated by Figure 6.

The circuit configuration is similar to that of the voltage regulator. The load is transposed into the divider network and the amplifier compares the voltage developed across a precision resistor (R sense) with the reference voltage (point A). If the reference voltage is held low (on the order of two volts), a very high compliance voltage circuit is achieved, as the entire supply voltage minus Vsat Q4 and the two volts across R sense can appear across the load. The heavy power dissipation is borne by the pass transistor, Q4. Stability of the circuit can be as good as the reference diode, as in the voltage regulator circuit.

Although the LMX71 supply voltage maximum is listed as 24 volts, it need not be a limiting factor should there be a necessity for a higher compliance voltage (to drive high resistance focus coils, for instance). Reference 12 has shown how the voltages range of the circuit can be extended by a simple discrete transistor booster.

For current applications greater than 50-100 ma, the device used for Q4 should be Darlington connected to an additional stage (shown dotted as Q5). Precautions should be observed for heat sinking of these power devices. With adequate transistors, the basic differential amplifier can control regulated currents of several amperes with voltage compliances limited only by the devices used.

Summarizing this regulator, several features bear emphasis. The low reference voltage contributes not only to circuit efficiency, but allows a lower value resistance to be used for R sense which means its dissipation will be smaller, enhancing temperature stability. The bulky power elements of this regulator are external to the IC package, and as a result the IC will not be subjected to large temperature excursions resulting from power dissipation in the pass elements. Again, it should be emphasized that this (or any regulator) is only as good as its reference voltage and for ultimate stability, tight regulation, low temperature coefficient devices should be specified for the reference diode and

the operating current maintained constant.

Deflection Amplifier

The applications of a stable DC current source for TV use are many: focus coils, alignment coils and long cable runs for power supplies. However, this same basic regulator can also be used as an AC deflection amplifier by reconfigurating the circuit and substituting a sweep voltage for the DC reference.

In this circuit (Figure 7) the differential amplifier is referenced to ground through the input resistor R1. As a result, the tendency for the circuit to seek a natural balance will place R sense at the same potential (0 volts) which means no static yoke current will flow. Since Q4 can supply only positive current (upper half of sawtooth), a negative pull down stage is added (Q5) to furnish negative supply current during the lower half of the sawtooth waveform. Q6 serves to regulate the emitter current of Q5 at a constant value.

Individual current and voltage requirements for this circuit are peculiar to the particular yoke and sweep time involved, and cannot be detailed here. The important point is that the IC differential amplifier can contribute considerably to this function due to its matching characteristics and the differential comparison, which forces the yoke current to be an exact current replica of the sweep voltage, non-linear or "corrected" voltage inputs to the circuit will result in a corresponding yoke current. If desired, DC centering can also be introduced via R1 and the centering control, Rc.

Many of this circuit's virtues are similar to the DC current regulator. Obviously, the output current will be a direct function of the amplitude and linearity of the input sawtooth voltage waveform, just as the DC regulator's stability is predicted upon the reference diode. Absolute levels of current and voltage are a function of the discrete devices used for Q4-Q5 rather than the IC itself, as in the DC circuit. □

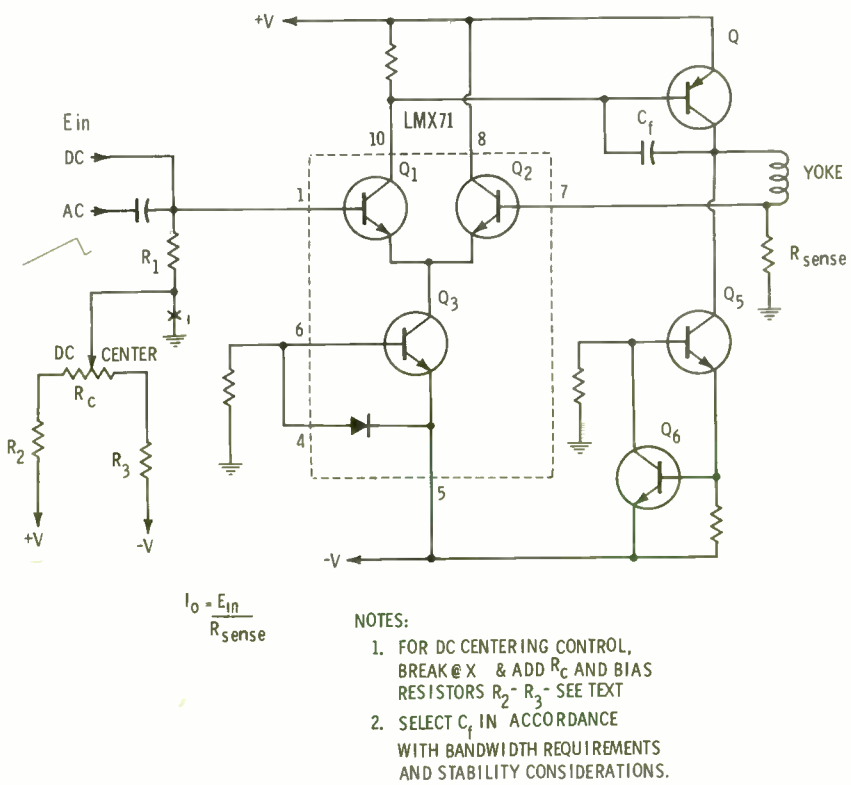

Fig. 7 AC deflection amplifier.

Editor's Note: Parts two and three of this survey will cover IC oscillator applications and specialty circuits. The reference sources used in this article are:

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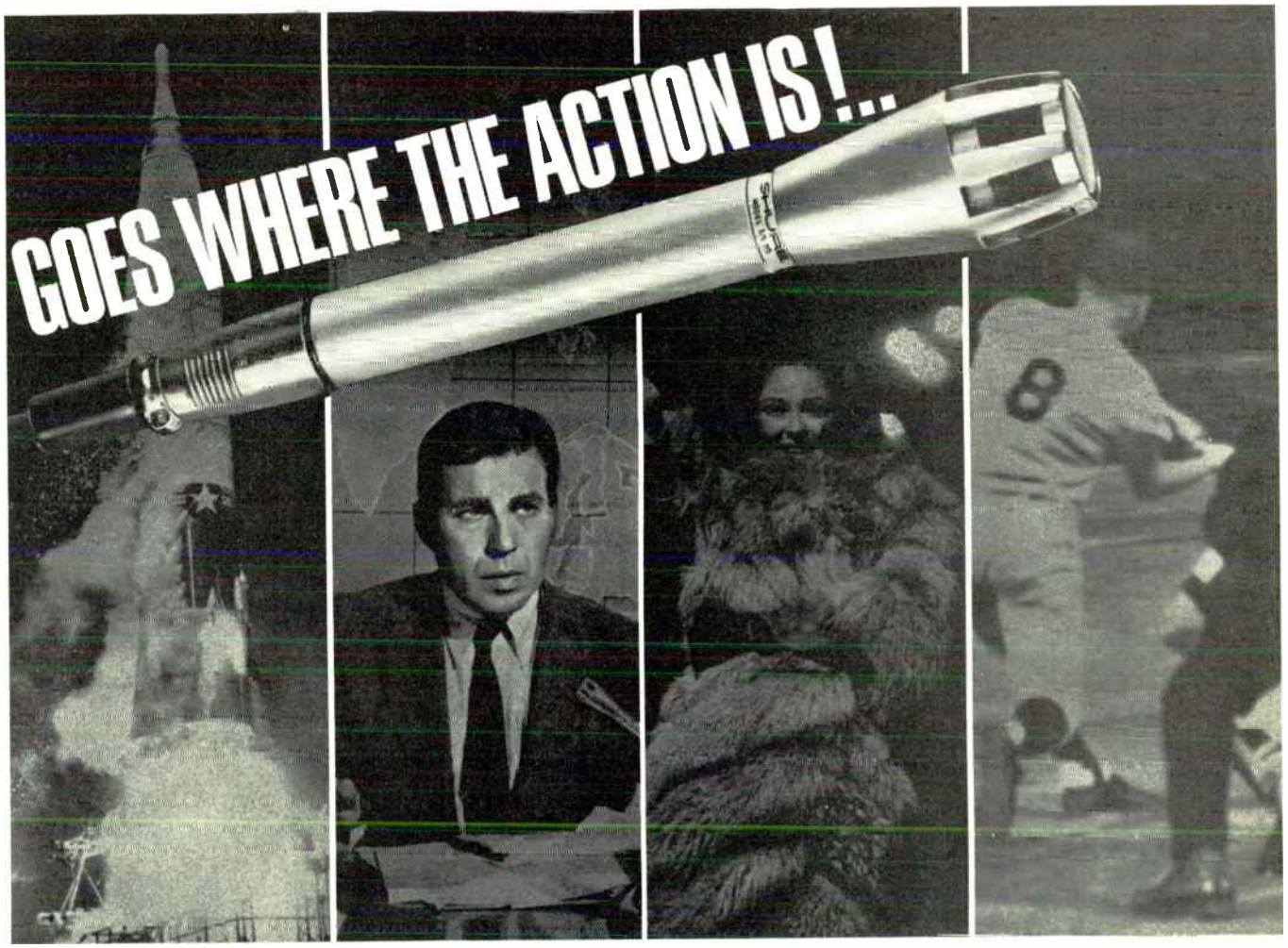

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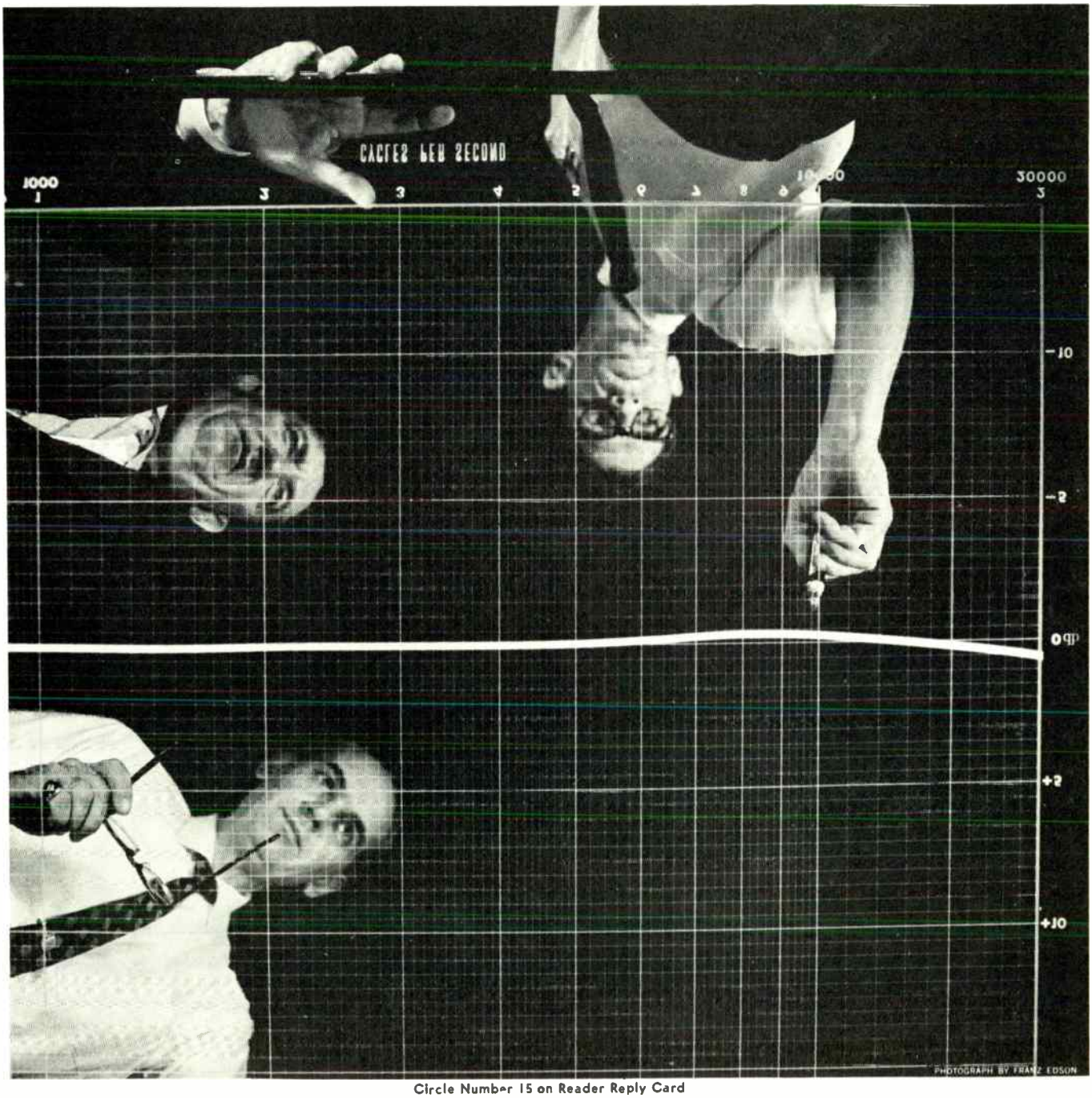

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Multiple program selection for CATV

■ The basic concept of community antenna television is to pick up television signals and pipe them down the line to home television receivers. At the recent NCTA convention, a national six channel package was proposed. This would add to the recent moves toward program origination, propelled along by the FCC proposals. And this would greatly expand the content of CATV offerings.

From the basic concept of supplying signals to homes that normally would receive only a few channels, CATV has moved to the brink of highly complicated multiple offerings.

The latest additional proposal for CATV service expansion comes from Rediffusion Incorporated of Montreal, Canada. Using a telephone selector dial, the viewer would be able to select any program no matter how extensive the choice becomes.

In the home, this would require dropping a cable, installing the selector dial, and an inverter connected to the television receiver. The inverter unit contains a single transistor and three semi-conductor diodes. It has no controls and, barring component breakdown, requires no attention.

The function of the inverter is to change the signal on the cable to a VHF channel which is free of interference from local stations. The receiver is left permanently tuned to this channel.

The subscribers inverter would offer a minimum level of the video carrier at 2 mV into 300 ohms. An FM sound carrier would not be more than 18 dB below the video carrier. The frequency drift after switching on would be in a range of ±70 kHz. The television receiver would be isolated from the network by 6 kV capacitors.

A conversion system could be used in present CATV systems that would offer double the number of channels. However sufficient this may seem for present conditions, it would require a much more sophisticated unit to equal the dialing system. Up to this point, it would seem that this system simply replaces the channel selector. It does more than this. It allows only one signal on the cable at a time—that signal (program) selected by the dial system.

Since only one incoming signal would be on the incoming pair at any time, the bandwidth of the cable need be only 5 MHz for NTSC standards. This would be for one-way communications. For two-way communications, the cable bandwidth requirements would need about 11 MHz. Thus the cable economics can be a factor. But the configuration of such a system is based on the old telephone exchange design. All programs are received on the same channel and are selected by a dial acting on a rotary selection switch at a program exchange.

The frequencies to be used for the common channel are preferably above the video band in order to simplify the receiving equipment. However, since cable attenuation is related to the frequency, there is a limit as to how far above the video band they should be.

The frequency selected for the luminance carrier is 7.94 MHz with the upper side of the band suppressed. The chrominance carrier therefore falls at 4.36 MHz, with the FM sound carrier at 3.44 MHz. The time delay error between luminance and chrominance carriers is ±40 Ns.

Delivering The Signal

Each television set is linked to a central exchange by a double pair circuit. One pair carries the program signal and the other carries the control signals.

The balanced pair of .018″ conductors carrying the program and a similar pair carrying the control signal are combined in a quad formation. At suitable intervals, the cables from six subscribers are combined at a junction box and are taken back to the program exchange in a 12-pair cable. In this cable, audio pairs are reduced to .016″.

The programs are delivered to the exchanges by means of a primary distribution network which may use any of the conventional methods of transmitting a television signal. For example, in a city where adequate underground duct space is available, the maximum simplicity and economy will be obtained by the use of a separate coaxial cable carrying the signal in the same form and on the same channel as that

The rotating contact of each subscriber's switch delivers the signals of his chosen program to his balanced line by means of audio and vision baluns. The rotating contact is driven by a simple stepping mechanism operated by impulses from the subscriber's dial, the necessary power being taken from a 50 volt DC source in the exchange. The subscriber is provided with a reset button which brings the selector back to its start position by means of a self-drive contact.

One type of selector switch is of printed circuit form with ten gold-plated contacts. The bus bar is constructed so that banks of these switches can be mounted one above the other. Thus, if more than ten programs are required, the first bank serves to select from program numbers 1 to 9, a second bank from numbers 10 through 18 and a third from 18 through 27 and so on. When a system is first established it might be limited to 10 programs and then extended by the addition of further switch banks as the demand for more programs arises.

The second form of selector switch makes use of magnetically operated reed switches. Thirty-six such switches are mounted radially on a circular base plate and a magnet on the end of a rotating arm causes the reed to operate as it passes over them. The arm is driven by a stepping mechanism controlled by the subscriber's dial. The reed switches can be removed or added, and in this way the programs available to particular subscribers may be varied.

The space occupied by the exchange equipment will depend on the number of television recivers served and the number of programs available to them, but the equipment required for 330 receivers each having a choice of 36 programs would be contained in a volume of 6 ft. x 5 ft. x 3 ft. In areas of low housing density, the exchange might therefore take the form of a kiosk. In areas of high density where the number of receivers might be about 5,000, the equipment would be housed on 9 ft. high racks in a room 27 ft. x 15 ft.

Conclusion

By using an exchange system, it would be possible to dial into a two-way operation, use private circuits, or make any number of program selections. Such a concept, aside from the arguments that could arise from considering its technical and cost implications, does offer a challenge. Certainly two-way CATV communications and the use of private and selected circuits does open up some new areas for service.

Educational and home viewers would probably be the prime users, because major telephone companies will surely develop video telephone services for business and industry. (After communicating with astronauts walking on the face of the moon, anything seems possible.) Here, at least, is one attempt to solve the selection problem for that point in the future at which a multiplicity of program material may be available.

A solid state logic film projector recue

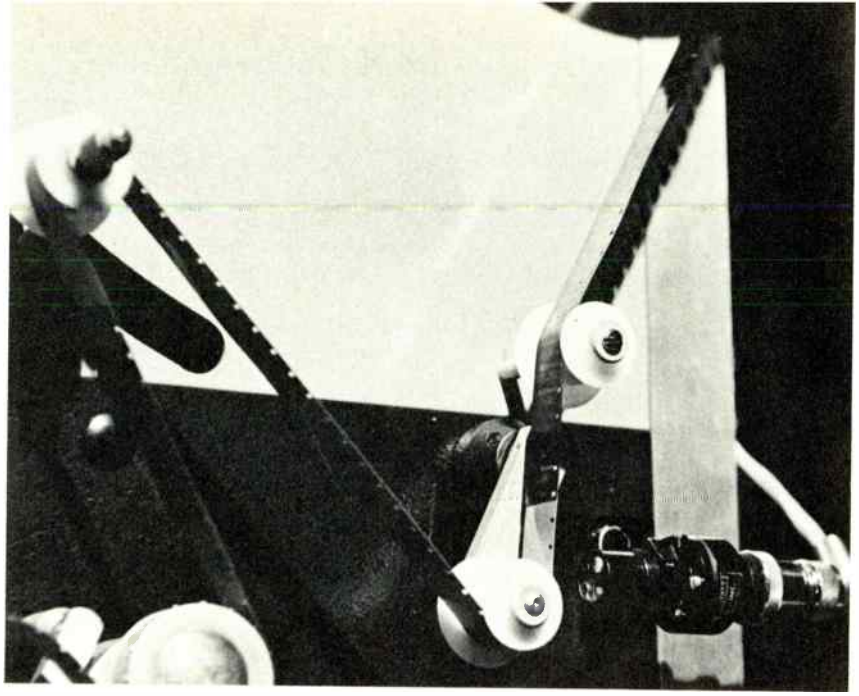

Fig. 1 Front view of loaded TP-66 projector showing sensor head and added roller.

By Fred Fowler*

The frantic advances in technology in the television business leave a person scrambling just to try and keep pace. In this environment, it is rewarding to feel, if only momentarily, that you are out in front by a nose.

There was a need at KOMO-TV for an improvement over the tab system of automatically stopping film projectors, because it consumed too many man hours, (over 20 hours per week). Incoming films occassionally had tabs left on them, and when they got past the screening personnel, they would stop the projectors while on the air. Lastly, a worn tab would not always stop the projector.

Design was begun around a Farmer's electric photocell sensor, its associated amplifier and relay. The sensor is mounted in an existing hole in the projector. It is positioned three seconds back from the gate and looks at the film continuously. When a white leader appears at this point, the light from the sensor is reflected into its receiving cadmium cell and fires a relay.

One set of contacts turns on a light in the director's booth indicating film on this projector will run out in three seconds. This eliminates the need for unsightly punch dots which previously served this purpose. The other set of contacts applies power to the KOMO-TV designed logic timer.

An idler pulley was added to keep the film a constant distance from the sensor for greater reliability. The tab system is disabled by removing the Fasten connected lead from the sensing sprocket. Stopping the projector at the precise point for correct restart is done by using a 28 inch white leader. A leader of 25 inches or less will roll through to the next film. A last minute decision to roll on past a stopping leader is still possible as the cue defeat system remains operational. The sensor head sees red, blue and green opaque leader the same as white if color coding is used to identify films. The projector can be returned to its previous state by unplugging the sensor and re-plugging the tab connection.

The second delay circuit was incorporated to utilize the fast start feature of the TP-66 projectors and preserve our mode of operation which calls for a 1½ second roll. A three second roll is used at some TV stations and if satisfactory could alleviate the need for additional delay by using the end of the leader to switch the projector off. Although designed for TP-66 projectors, the system will work as well on a TP-6 or other brands with some modification.

Theory of Operation

When the projector is running, the run light indicator is on and furnishes +24V to the anode of Q-2 (a thyristor). This remains an open circuit until the gate is opened. The leader light sensor applies +24 to the timing circuit at the emitter of Q-1. This circuit, consisting of R-1, R-2 and C-1, will start charging towards 15 volts. With a roll through leader of 3 seconds, the charge does not build up enough to fire Q-1 (a unijunction transistor), and at the end of the roll through leader, the 24 volts is removed from the charging circuit and the charge accumulated on C-1 leaks off to ground through R-2 in preparation for the next cycle.

A stop-down leader of 28 inches in length (4 seconds) allows the charge to build up enough to fire Q-1, which in turn applies a positive voltage to the gate of Q-2. Current starts to flow through Q-2 and

*Project Supervisor, KOMO Seattle.

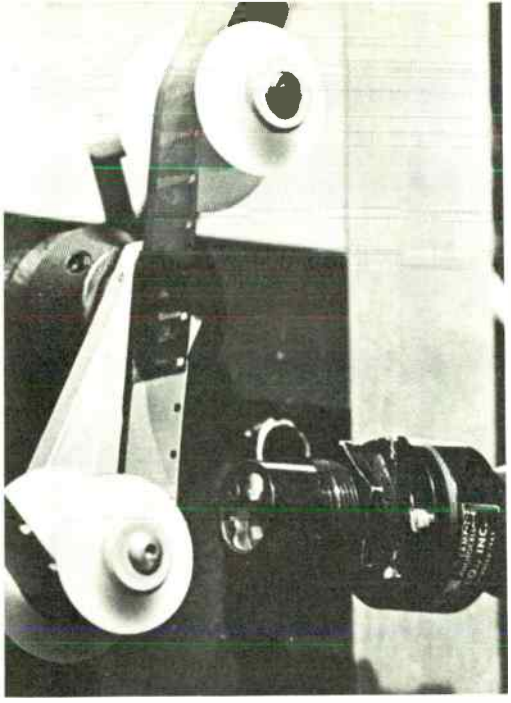

Fig. 2 Upper roller was added for proximity control. Sensor head is looking at leader just above lower roller.

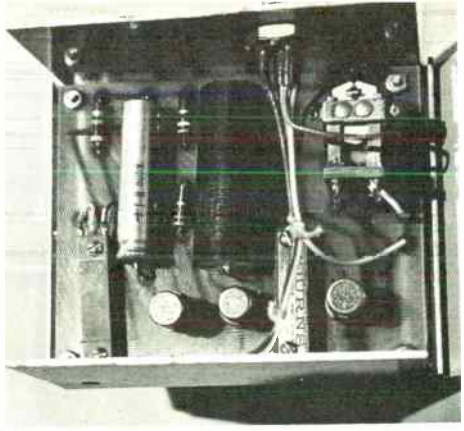

Fig. 3 Completed sensor timer built on KOMO-TV printed circuit board. Stopping relay is in upper right corner of board.

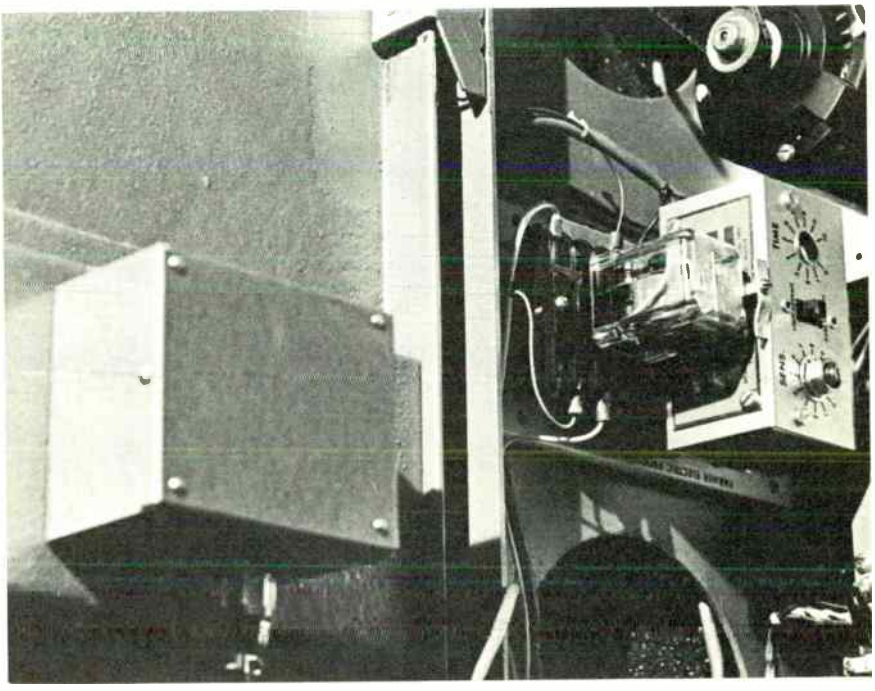

Fig. 4 Minibox at left is the sensor timer mounted on inside of projector rear door. At right is relay, power supply, and amplifier module.

R-4 which keeps the thyristor turned on. At the point of the gate opening, the timing circuit of Q-3 starts to charge toward the firing point. On firing, Q-3 will close K-1 which grounds the projector stop circuit and stops the machine. When it stops, the voltage is removed from the projector run light and the anode of Q-2. This re-sets the entire system and it waits for the next information from the leader light sensor.

Field testing showed a need to add a −12 volt command which is picked off of pin 7 of K-112, fed through capacitor C-3 to turn off the thyristor and disable the stopping circuit so that cue defeat may be released without stopping the machine.

This system allows precise stopping of the projectors without the use of metal tabs and it preserves the cue defect system. When the unit is unplugged, the projector may be operated as a tab stopping system.

All terminal block numbers are included on the diagram for correct installation on a TP-66 projector. The accompanying printed circuit allows all listed components to be fitted into a 3″ x 3″ x 3¾″ minibox. An Amphenol male chassis jack is installed on the box for easy disconnect or replacement.

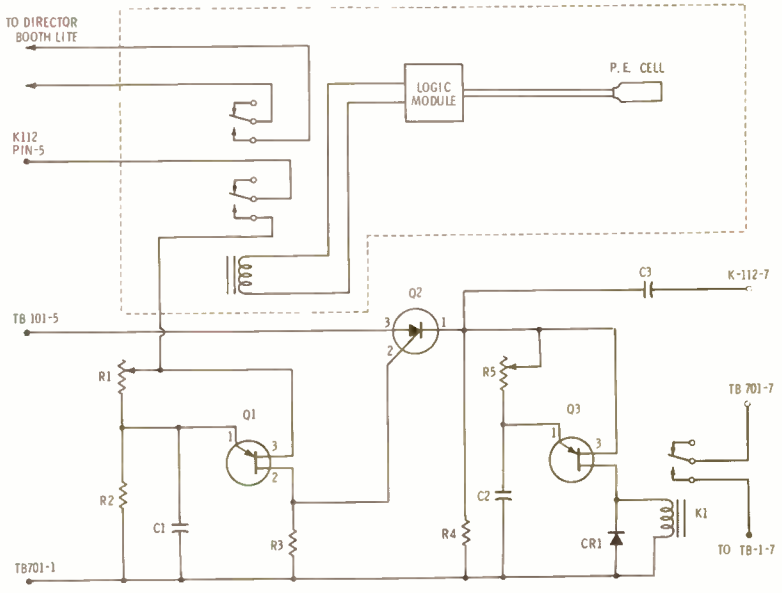

Fig. 5 Schematic for the KOMO-TV recue unit.

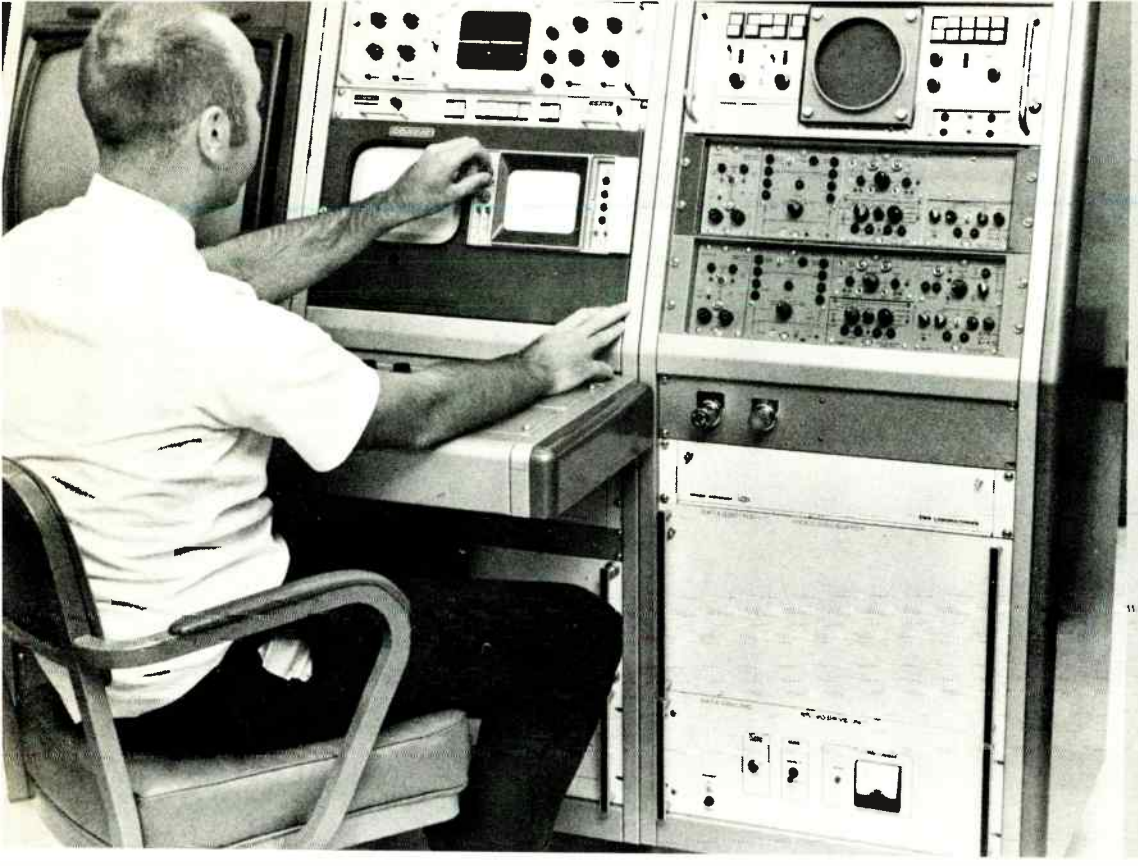

Fig. 1 Operator at the controls of the color converter at the Manned Spacecraft Center in Houston. The Data Disc unit was designed by CBS Labs. The image enhancer was also designed by the Labs for NASA.

Processing the field sequential color TV signal

■ Bringing signals back from space has involved the interface of equipment by many manufacturers and their cooperation as well.

The operator's position at Houston shown in the picture includes units from CBS Labs, Cohu, Conrac, Data Disc, Tektronix, and Telemet. On the other end, the camera used for the Apollo 11 mission was built by Westinghouse. It used a field sequential system that originated at CBS Labs. The transmitter was built by Collins.

Using the field sequential system meant that the signals received in Houston would show the colors red, blue and green in sequence instead of simultaneously, as is the process in commercial TV.

In order to change these signals for network use, the Data Disc video recorder system was inserted as shown in Figure 1. Here is how that system worked.

A rotating memory disc in the system records the incoming color images one at a time on different tracks—first red, then blue, and then green. When all three colors are recorded, they are automatically picked up in parallel, replayed into a network encorder, and then transmitted over commercial TV.

The NASA video disc recorder system was put together using standard Data Disc building blocks. Basically, it consists of a fixed-head parallel video disc recorder rotating at 3600 rpm, a modem (modulator/demodulator) unit, a servo drive system, a video delay unit and all necessary logic and switching circuitry.

The incoming, sequential video signals from the spacecraft are converted by period modulation techniques and switched in proper sequence for recording on one of six active tracks on the disc recorder. Replay from the disc is arranged so that the six tracks are utilized in three pairs where each color image is stored on a pair of tracks. Using this method of two tracks per color enables one track to be read (replayed) while the other track is updated.

Special switching of the replay signals must be accomplished to provide a fully interlaced TV picture compatible with commercial networks. Since a single field of video information is stored on one track, video delay networks are used for continuous-interlace, compatible replay.

Rotational speed and phase of the disc is maintained in precise synchronism with an external crystal source by a tightly coupled servo drive system.

Since the color camera used in the command module was not designed for use in the vacuum of space, the small Westinghouse black and white camera was used instead. It had met all the NASA specifications for operation on the moon. There were some who felt that even

(Continued on page 42)

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New "Scotch" Brand Color Video Tape guards itself against damage.

Guards against cinching. "Scotch" Brand No. 400 now solves your video tape handling and shipping problems. A new, matte-finish back treatment virtually eliminates cinching, windowing and creasing. Capstan slippage is a thing of the past.

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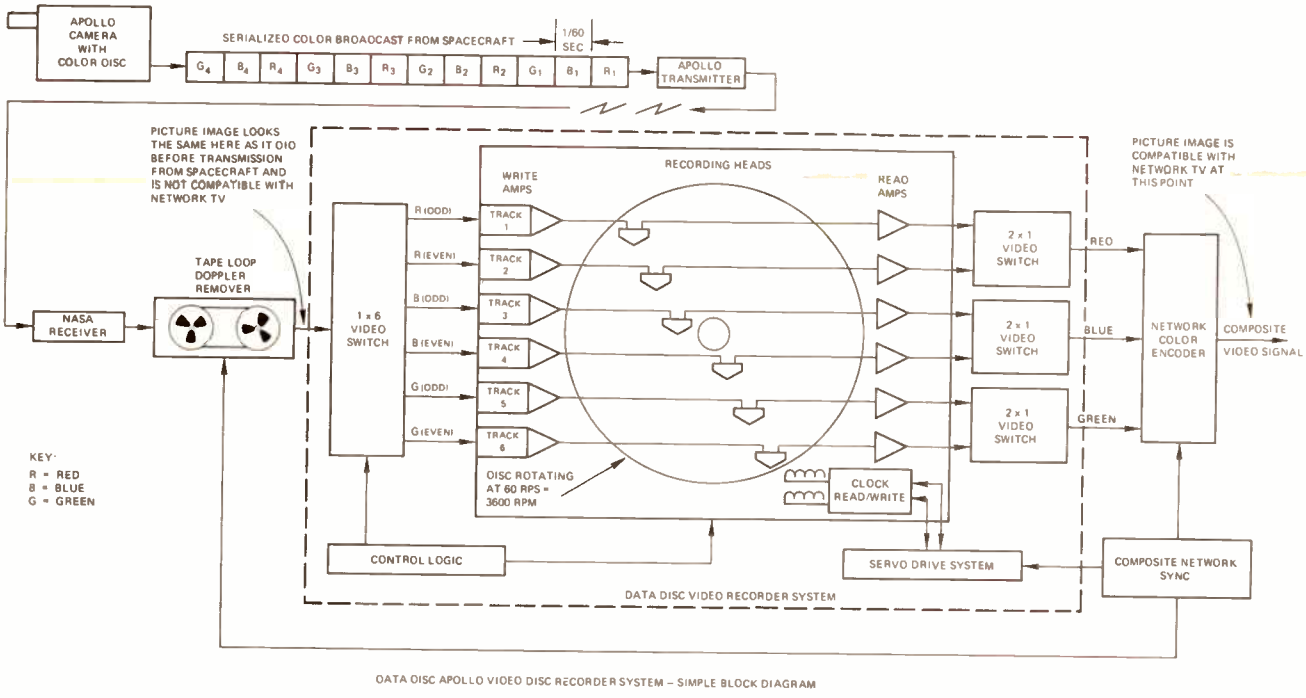


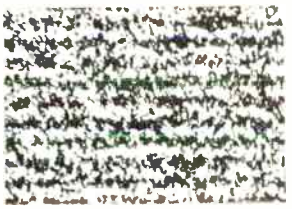
DATA DISC APOLLO VIDEO DISC RECORDER SYSTEM – SIMPLE BLOCK DIAGRAM

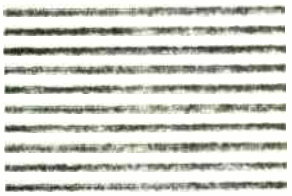
Fig. 2 Apollo video disc recorder system.

this camera could have been used with a hand rotated color disc in front of the lens. But even if successful, it would have called for extended extra vehicular activity by the astronauts. It was a matter of choice as to how important color would be at this point.

Surely color will be used in future telecasts from the moon. And until other cameras are developed for use in space, sequential conversion will remain a key factor in the interface of the Houston Space Center television system. ▲

GOOD-BYE KINE
HELLO EBR-100





Television raster lines (right) enlarged from 16mm film frames. Lower: EBR-100 recording on 3M fine-grain (less than 0.1 micron) electron recording film. Top: kinescope recording on television recording film. Line-to-line spacing in both pctures is approximately 0.00058 inches or 14.7 microns.

TRANSFER LIVE OR TAPE TV TO 16 MM FILM ELECTRONICALLY AND GET PRINTS WITH 1000-LINE RESOLUTION.

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The 3M Brand EBR-100 far surpasses the conventional kinescope in reproduction quality and in the ability to produce consistently good films. It opens new horizons for TV taping and mass film distribution for educational and training purposes.

The EBR-100 is a machine that every major TV studio, dubbing center, film lab and government communications center will want to employ. Easy to install, completely self-contained.

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The EBR-100 records on low-cost fine grain film. Overall resolution exceeds 1000 lines. The film uses conventional processing and is shown on standard 16mm projectors.

The unit is 68 inches tall, 46 inches wide, 34 inches deep, weighs approximately 1000 lb. and costs about $55,000. Optical or magnetic sound is available at extra cost.

For details, call our EBR-100 information phone. The number is (805) 482-1911, ext. 216. Or write to EBR-100 Dept. at the address below.

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Circle Number 20 on Reader Reply Card

Servicing Tips for Transistorized Circuits

By Carl Babcoke*

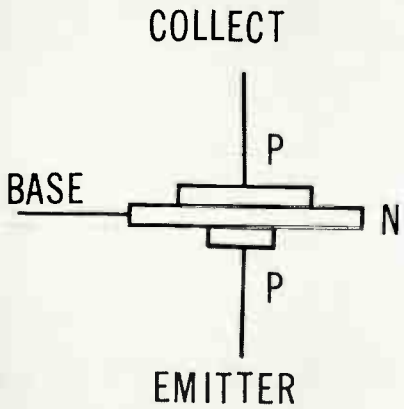


Fig. 1a PNP transistors have a thin section of "N" material between the "P" sections. NPN types are reversed.

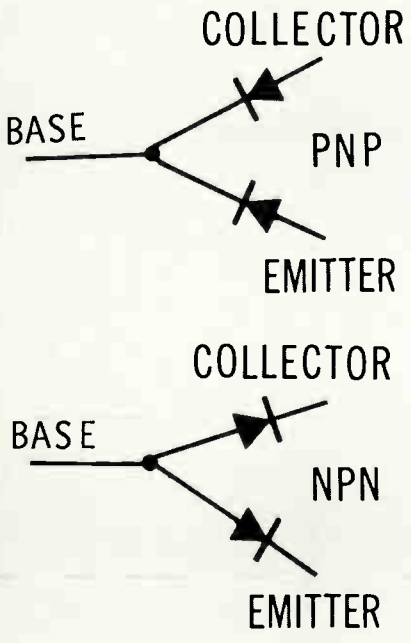


Fig. 1b Each junction of "P" and "N" material has diode properties. For resistance tests they can be diagramed as diodes.

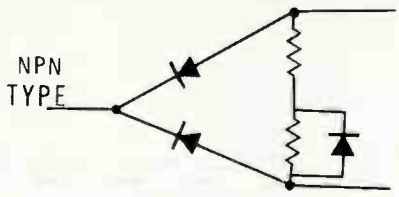


Fig. 2 This is the equivalent of a transistor when it is measured by an ohmmeter.

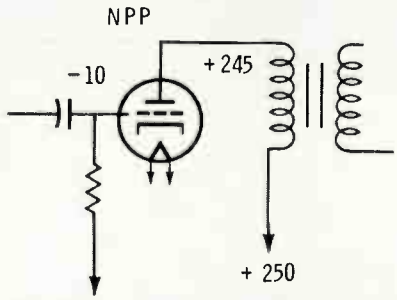


Fig. 3a Any tube could be called an NPP type since both grid and plate will pass current if they are positive in relation to the cathode. In practice, a tube is operated with a reverse-biased grid and forward-biased plate.

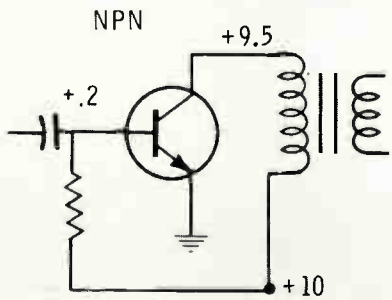


Fig. 3b Transistors are operated with the base (grid) forward-biased, and the collector (plate) reverse-biased. Forward-biased elements are low impedance and reverse-biased elements present a high impedance.

Think of Transistors as "Black Boxes".

Knowledge of the internal construction and chemistry of a transistor is not necessary for efficient troubleshooting. But it is very helpful to take the basic physical construction of a typical tansistor (Fig. 1A) and visualize it as two diodes wired back-to-back as shown in Fig. 1B. Of course, two separate diodes cannot possibly have collector-emitter current and thus cannot amplify.

In an actual transistor, the two diode junctions are seldom symmetrical and the base material is so thin that current can flow through it between collector and emitter when stimulated by collector voltage and a forward base bias. Varying the base bias by a signal causes collector current variation; this is amplification.

According to the way a transistor measures on an ohmmeter, its "black box" circuit consists of three diodes and two resistors, as shown in Fig. 2A. The chart in Fig. 2B is a good guide to the approximate readings expected with germanium transistors when checked on a VTVM has a 1.5 volt ohmmeter battery. Don't be surprised if many normal transistors show more base-emitter than base-collector leakage. This only means the collector and emitter are not symmetrical. If you use other scales, or a meter with another battery voltage, the resistance readings will be radically different, since all solid-state diodes change resistance according to the voltage applied to them.

The same low base-emitter, base-collector or collector-emitter ohmmeter reading when the test lea

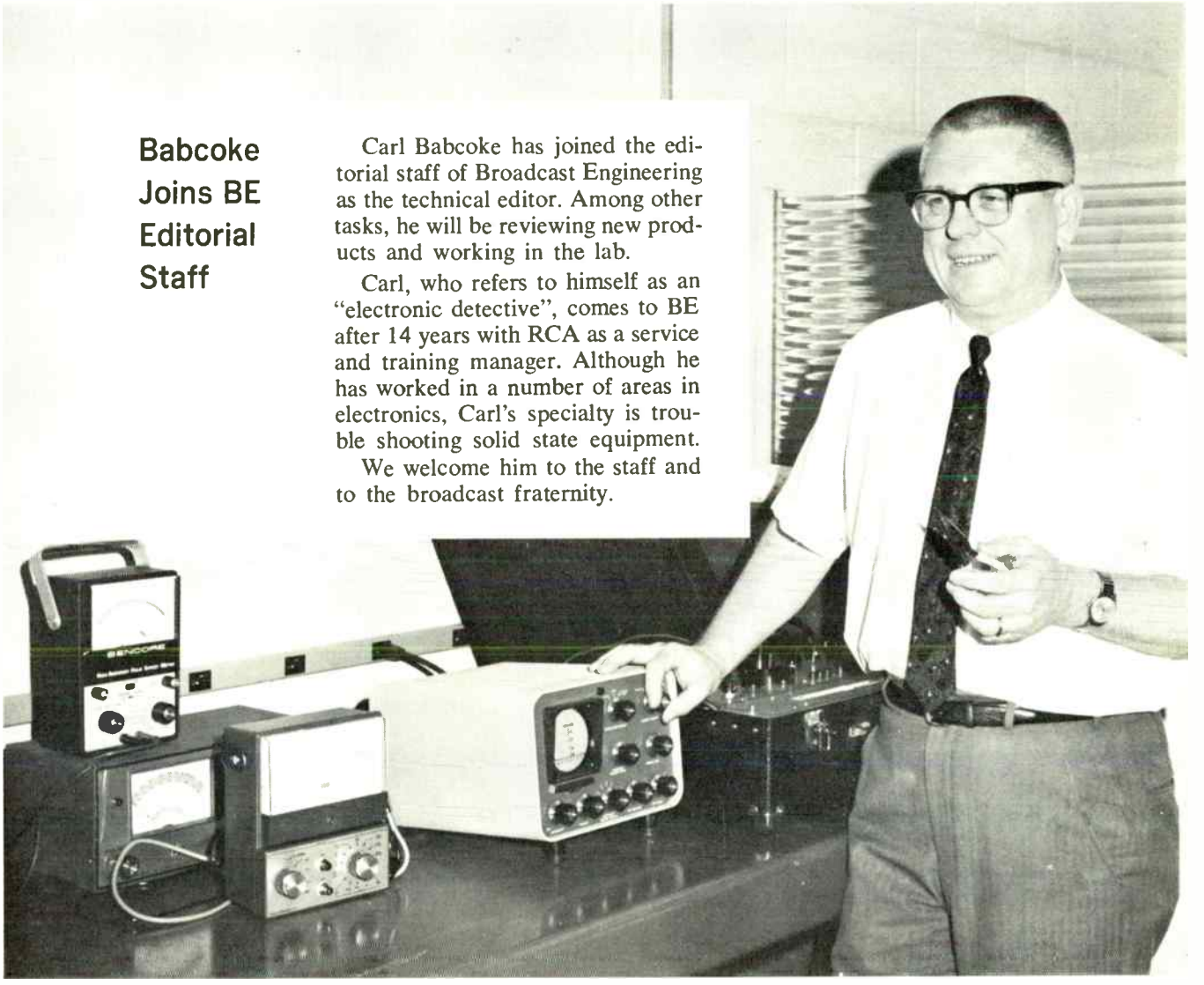
*BE Technical Editor

Babcoke Joins BE Editorial Staff

Carl Babcoke has joined the editorial staff of Broadcast Engineering as the technical editor. Among other tasks, he will be reviewing new products and working in the lab.

Carl, who refers to himself as an "electronic detective", comes to BE after 14 years with RCA as a service and training manager. Although he has worked in a number of areas in electronics, Carl's specialty is trouble shooting solid state equipment.

We welcome him to the staff and to the broadcast fraternity.



polarity is reversed, indicates a defective transistor with a shorted junction. An open reading for both polarities indicates an open junction. One common defect is a short from collector to emitter. Often there is no corresponding short from the base to either the collector or emitter. This is difficult to understand since the base is located between them. Evidently the excessive current caused by the collector-emitter short burns away the base material around the shorted area.

Silicon power transistors also can be checked as shown in the chart of Fig. 2B, although all the resistances will be much higher than those listed. Tests of small silicon transistors will be limited since the leakage resistance will be above the highest ohmmeter scale. During checks on both germanium and silicon transistors, don't use a lower scale than the ones specified in the chart for forward bias readings because the ohmmeter current (which reaches 150 mills on the X1 scale) might damage small transistors.

You may question why we should bother to check transistors with an ohmmeter when there are many excellent transistor testors on the market. First, there are many more ohmmeters that transistor testers around a typical workbench. But more important, the ohmmeter tests give more of an insight into circuit voltage and resistance measurements and how they are affected by transistor defects. It is excellent belt-and-suspenders technique to use ohmmeter readings to verify the verdicts of the transistor tester.

Tubes vs. Transistors

After the obvious lack of a heater in a transistor and the necessity for a high vacuum surrounding the elements of a tube, the next radical difference between tubes and transistors is in the polarity of the bias and the elements, as shown in Fig. 3.

A tube without bias (grid shorted to cathode) will draw excessive plate current. A transistor without bias (base shorted to emitter) will have a minimum collector current, and

Test	Connect negative lead to:	Connect positive lead to:	Ohmmeter scale	Desired reading in ohms
Small RF and audio transistors				
Forward	base	collector	X10	50 or less
Forward	base	emitter	X10	50 or less
Leakage	collector	base	X10K	20K or more
Leakage	emitter	base	X10K	20K or more
Forward E-C	collector	emitter	X1K	2K or less
Leakage E-C	emitter	collector	X1K	25K or more
Power transistors				
Forward	base	collector	X1	5 or less
Forward	base	emitter	X1	5 or less
Leakage	collector	base	X1K	10K or more
Leakage	emitter	base	X1K	10K or more
Forward E-C	collector	emitter	X10	2K or less
Leakage E-C	emitter	collector	X100	4K or more

Fig. 2B Chart for measuring the junction resistances of PNP germanium transistors. All polarities should be reversed to test NPN types. These readings are for VTVM's using a 1.5 volt ohmmeter battery. Meters with other battery voltages will show different resistances.

making the base positive increases the collector current. The tube plate voltage is positive, the polarity to cause maximum conduction, while the grid is negative to prevent any grid current.

By contrast, the positive voltage applied to the transistor collector will cause less collector current than would a negative supply (but this current would not be under the control of the base-emitter). The base is positive which is the polarity to cause maximum base current. A negative base voltage would be reverse-bias and would result in no base or collector current (except leakage).

To say these facts another way, a grid is reverse-biased, a plate is forward-biased, a base is forward biased and a collector is reverse-biased. A transistor always draws base current (low impedance input) and a tube has no grid current (high impedance input) when both are operated in class "A".

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Circle Number 22 on Reader Reply Card

An approach to automated phasor design

By D. R. Denning,
RF Design Engineer, Gates Radio

■ Since 1937, directional antennas have helped new stations squeeze into the congested AM broadcast band and for 30 years communications engineers have wrestled with the time consuming repetitive calculations involved in the design and specification of directional patterns and the equipment necessary to produse the phased array.

While it is recognized that each phased array presents a unique design problem, the mathematical methods employed in reaching a successful design do not vary significantly from case to case. Even with the basic mathematical similarities in each design problem, the engineer has been forced to calculate each design manually, first determining the phased array necessary to produce a proposed AM directional pattern and secondly computing and specifying the phasing system to effect the necessary pattern.

With the coming of the small engineering computer and the existence of real-time shared computer facilities, communications engineers have been able to adapt many of their calculations to machine solution. But, whether the computer technique is utilized by the consulting engineer in specifying the physical antenna array, or by the systems engineers in determining the networks necessary to produce the phasing of the array, the technique has been of a piecework nature. Certain calculations are made by machine; the results are inspected by the engineer, and re-entered into the machine under a different program for further computation, and the process continues. The engineer is thus required to perform interim work on a design.

Perhaps this type of process is necessary in the specification of a phased array to produce a desired directional pattern, but it is not necessary, from an engineering standpoint, to apply the piecework computerization technique to the design of the phasing system equipment. The importance of the full specification and precise design of phasing systems has been discussed by R. S. Bush.

A complex computer program for phasing system design has been developed at Gates Radio Company. Utilizing as input the data defining the desired directional pattern, the single FORTRAN program computes all impedances, phase shifts, network configurations, guaranteed tuning ranges, and component values and ratings necessary for a suitable phasing system, without additional information or further action from the engineer.

To grasp the complexity of the programming involved in producing this complete design technique, the necessary computing hardware and the program design technique will be covered in this article.

The Computer

Major computing facilities applied in the development of the phasing system design program are located in Cleveland. At the time of program development, the hardware configuration at this installation included a Honeywell Series 200 Model 200 computer with four 20 kHz tape drives and a 20K character memory.

The computer center in Cleveland is linked to the Gates Engineering offices in Quincy, Illinois, by a hard-copy communication system supplied by Xerox Corporation. Using a slow-scan process, the Xerox Telecopier network provides hard-copy data and result transfer and permits computer results to be returned to Quincy within 24 hours after data submittal. Standard long distance telephone communications are utilized in this data link.

Chaining

The key to handling large scale programs on the Honeywell 200 computer is an advanced programming technique termed "chaining". The availability of the chaining process permits programs of up to about 600,000 characters to be run on the machine without interim data transfer or operator assistance. Under the chaining process, the major program is divided into several program blocks or "chains", each constituting a machine memory load. The computer acts on each chain in succession, storing meaningful results. Upon completion of a given chain, the memory is cleared of all information except that contained in the specified area. The succeeding chain is then entered into the machine memory from magnetic tape, and the preceding results are utilized in the computations involved in the new chain.

The phasor design program employs the chaining process to permit solution on the Honeywell 200 configuration. The machine will accept up to 30 separate 20K character memory loads within a single program; the phasor design program consists of 28 such loads, or a total of about 500,000 characters.

A complete program run which results in a comprehensive phasor design may require up to 30 minutes of computer time to produce all results from input data and the compiled program tape. This run time is dependent upon the number of active elements in the phased array.

The phasor design program is written specifically for use on the Honeywell 200 machine, utilizing the FORTRAN language termed FORTRAN "D". However, with little or no modification, the program should be executable on any machine possessing sufficient memory, chaining techniques, and an unrestricted FORTRAN IV capability.

Input data for this phasor design program consists of the parameters specifying the required directional array. The program has been written to solve the phasor design problem with seven items of data.

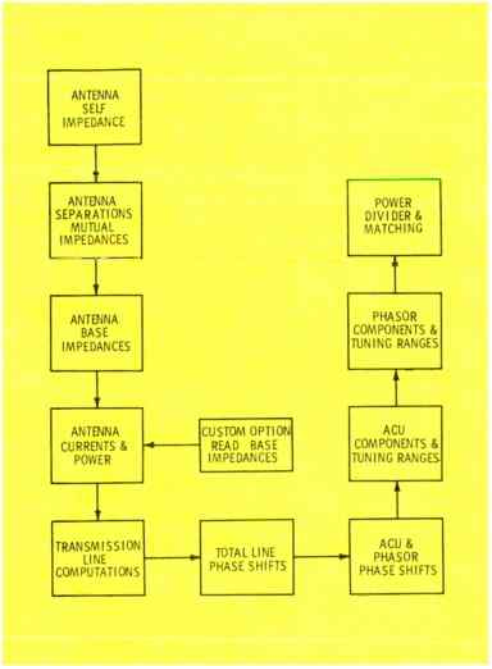

Fig. 1 Major computation areas of the phasor design program.

1. Broadcast frequency in MHz.
2. Tower height in feet or degrees.
3. Number of active elements in the array.
4. Physical tower locations at the antenna site in Cartesian Coordinate form.
5. Tower field ratio data, including relative magnitude and phase angle.
6. Licensed broadcast power in watts.
7. Transmission line data for each tower, including the attenuation, velocity factor, characteristic impedance, and line length in feet.

Major Computations

The basis for the design program may be set down in the ten distinct mathematical sections. The program computes tower self-impedances using the tower height, construction, and field-experience charts. It figures antenna separations and all mutual impedances for the array, solving the standard equations for mutual impedances set forth by G. H. Brown and R. King. Base impedances, both positive and negative, are calculated, using mutual and self-impedances and the tower field ratios and all antenna base currents and power are found. Transmission line computations include phase shifts in the lines; input power to each line, overall transmission line efficiency and allowable deviation from input line lengths.

Next, the total phase shifts required in each line are investigated, and ACU and phasor network phase shifts are then calculated. To provide quantitative values for network phase shifts, all lines and towers must be considered together. The final purpose of the phasing system is to provide the correct phase shift in each line to feed the corresponding tower at the current phase indicated by the angle of the field ratio.

This calculation for PHI, the total phase shift from common point to antenna, is made for each line in the antenna array. Thus, we have an array PHI(I) where I=1, 2, 3, . . . N. For mathematical simplicity, all values of PHI are referenced to a common value, any one of PHI such that PHI(I) is replaced by REF —PHI(I), where REF is the reference value.

Using the new array of values for PHI, all values must be reduced to $|PHI|<360$, where $|PHI|$ denotes the absolute value of PHI. To provide a standard design using this technique, all values of the array PHI must fall into any of the following three design areas: $|PHI| \leq 20$; $74< |PHI|<101$; or $149< |PHI| <200$ (PHI in degrees).

If the above conditions cannot be met, the following are considered: $|PHI| < 30$; $60 < |PHI| < 115$; or $130 < |PHI| < 200$ (PHI in degrees).

On the basis of stability, ease of adjustment and economics of design, the "tee" network configuration is used for phase shift and matching applications. Ideally, the tee configuration is designed with a phase shift of 90 degrees. Designing all networks to 90 degrees is seldom possible, but good design crieteria dictate that the phase shift be as close to the 90 degree ideal as possible. Therefore, definite limits have been placed on acceptable phase shifts, thus guaranteeing that all tee networks have a phase shift greater than 60 degrees, but less than 115 degrees.

To facilitate all PHI values falling into these ranges, any value may be added or subtracted from a value of PHI so long as the same operation is performed on all values of the array. By this method, all values of PHI are adjusted to meet one of the above design areas. Once the array of line phase shifts has been adjusted to acceptable values, these values must be divided into phase shifts to be made by the antenna coupling unit, (ACU), and the phasor network.

The value of the total line shift, PHI, is divided between the ACU and the phasor as follows:

If $|PHI| < 30$ and $PHI \leq 0$
ACU phase shift = ACUPHI (in degrees)
$ACUPHI = (90 + (|PHI| /2)) X (-1)$
Phasor phase shift = PSRPHI (in degrees)
$PSRPHI = 90 - (|PHI| / 2)$
If $|PHI| < 30$ and $PHI>0$
$ACUPHI = 90+ (|PHI| /2)$
$PSRPHI = 90 - \frac{[90 - |PHI|]}{2} \times (-1)$.
If $60 < |PHI|<115$
$ACUPHI = PHI$
$PSRPHI = 0$ (zero).
If $130<|PHI|<200$
$ACUPHI = PHI/2$
$PSRPHI = PHI/2$

The program continues by calculating all ACU circuitry. These calculations include the computation of guaranteed tuning ranges for antenna resistance and reactance and the precise value required for each component, including voltage and current ratings.

Phasor network specification follows and results from calculations include the range for adjustable phase shift and the precise values required for each component, including voltage and current ratings.

The program concludes with a rigorous investigation of power division circuitry, a calculation which is often omitted from manual design. The power division circuitry is computed for both the Shunt (Ohm's Law) type and the Series type. In each case, a full 90 degree tee network is provided for common point matching. Results here include guaranteed tuning ranges for the matching network, and precise component values including voltage and current ratings.

Output

Output from the phasor design program is in the form of a printed report. Complex output routines are utilized to provide a report which includes full identification for all results. Thus, the computer printout may be interpreted by persons unfamiliar with the computer technique, or with any single design problem. The printed report provides the engineer and the customer with a full description and specification of proposed phasing system.

Exact values for inductances and capacitances are provided in the report rather than standard values as are available in discrete components. It is felt that the inclusion of the precise values required provides a true and meaningful picture of the circuit. A typical phasing system resulting from the computer is illustrated in schematic form in Figure 2.

Conclusion

Through the use of a medium scale third-generation computer, the various calculations involved in successful phasor design have been welded into a single computer program. For the first time, the engineer has found a tool to free him entirely of the repetitive calculations required in the specification of phasing systems.

The use of this computer technique makes possible an intensive study of design problems. The inherent high speed of machine solutions produces within 30 minutes a design which could involve 40 hours of valuable engineering time. The significance of this time saving is further enhanced by the fact that the engineer is free to pursue other projects in the time previously required for phasor design.

As in any lengthy and tedious calculation, the possibility of human error and approximation occurring in phasing system design computation is quite high. Provided that the initial input data is accurate, the comprehensive computer program virtually eliminates the possibility of human error in design calculation and specification. Thus, the phasor design program saves time, improves accuracy and produces better results over manual or piecework computer methods.

In spite of the present capabilities of the phasor design program, additional areas exist for continued computerization. Previously limited by machine size and capability, the program could be expanded to produce a complete parts list utilizing library tapes of standard component values and types. The addition of a computer plotter to the hardware configuration would allow the production of a system schematic diagram directly from results computed within the program.

Additional subroutines with the program might provide for a list-out of all acceptable designs for a given directional array, or in a more sophisticated sense, the selection of the most practical or desirable system based upon design criteria.

These additional capabilities are possible within the next few years, as the computerization of the phasor design technique grows with the concept of machine-assisted design in the broadcast industry.

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"High Frequency Models in Antenna Investigations", G. H. Brown and R. King, Proc. I.R.E., vol. 22, pp. 457-480, April, 1934. □

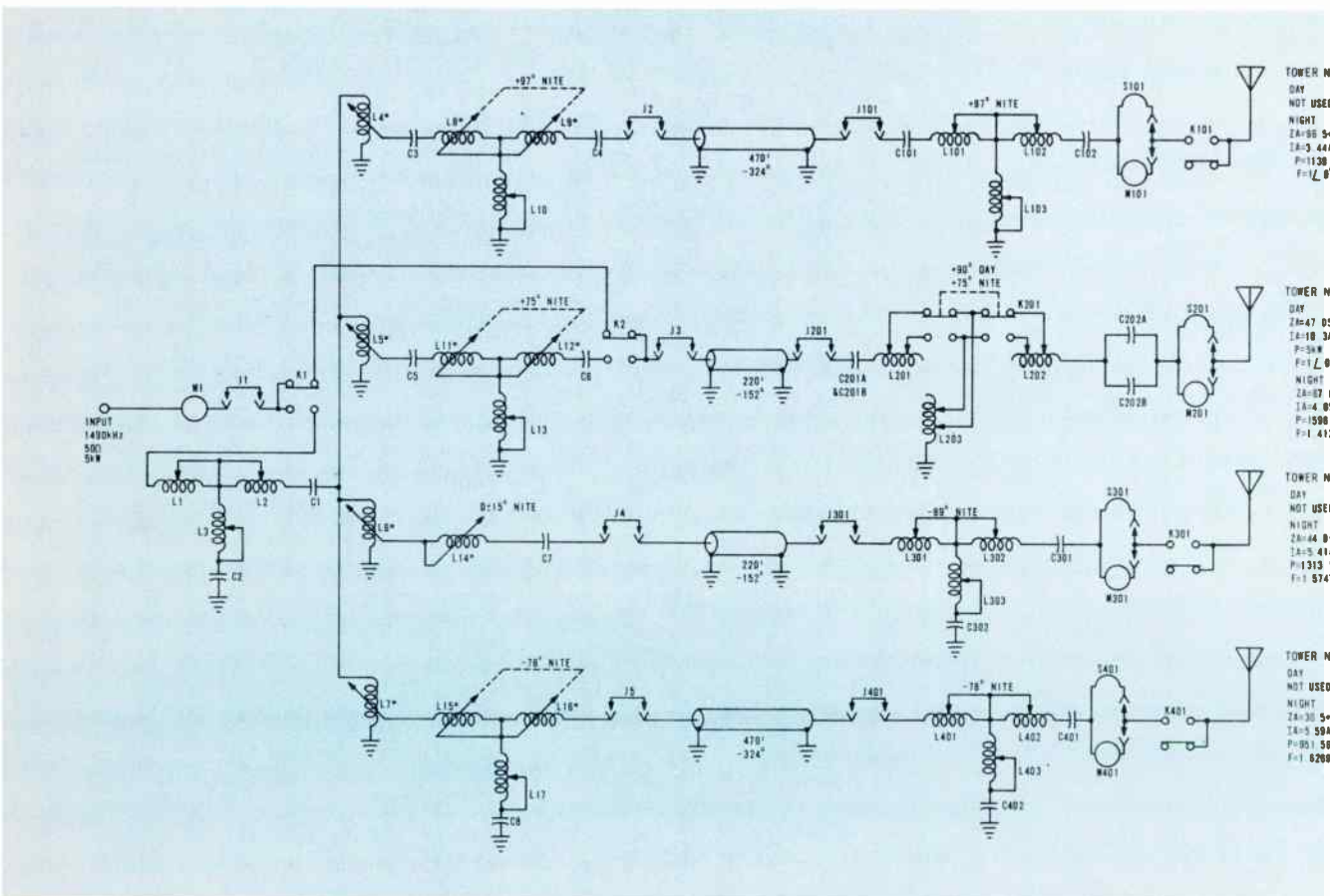

Fig. 2 Four tower system phasor computer designed for daytime and nighttime operation.

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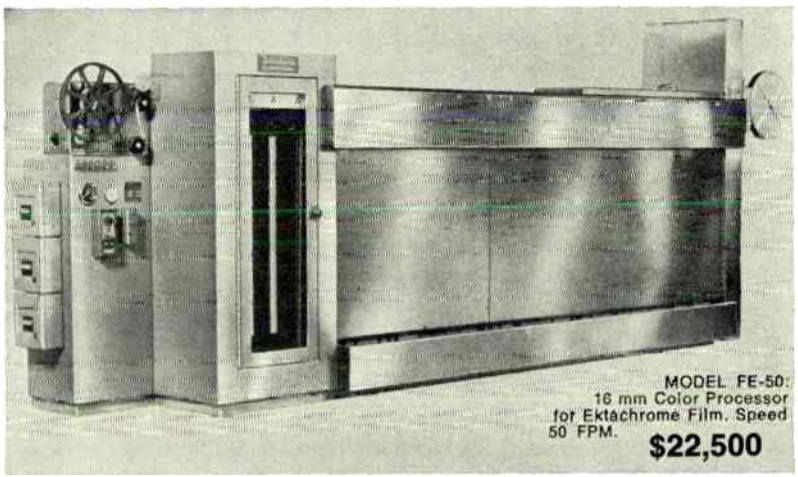

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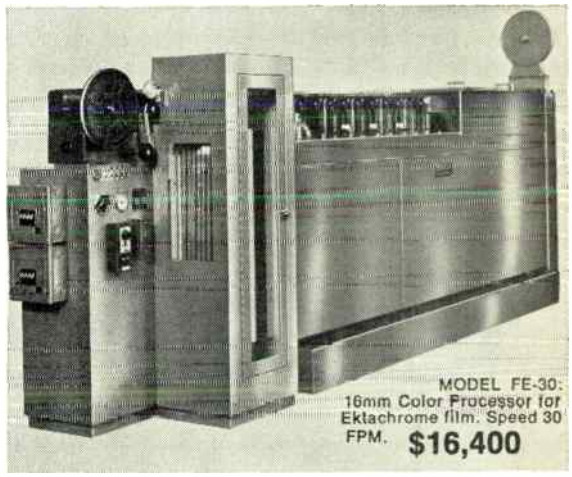

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- **"TURBO-FLOW"** impingement dryer. Shortens dry-to-dry time, improves film results, and carefully controls humidity content of your valuable (and sometimes rare) originals. Immediate projection capability is assured because the film dries flat without the usual curl associated with other film processors.
- **"ZERO DOWN TIME"** The reputation of any film processor is only as good as its reliability. The combination of the exclusive and special added Filmline features guarantees trouble-free operation with absolute minimum down-time and without continual operator adjustments. Recapture your original investment in 2 years on maintenance savings alone. Filmline's "Push the button and walk-away processing" allows inexperienced operators to turn out highest quality film.
- **"MATERIALS, CONSTRUCTION AND DESIGN"** All Filmline machines are constructed entirely of metal and tanks are type 316 stainless steel, heliarc welded to government specifications. The finest components available are used and rigid quality control standards are maintained.

Compare Filmline features to other processors costing more money. Feature-by-feature, a careful evaluation will convince you that Filmline offers you more for your investment.

Additional Features included in price of machine (Not as extras).

Magazine load, daylight operation ■ Feed-in time delay elevator (completely accessible) ■ Take-up time delay elevator (completely accessible) ■ Red brass bleach tank, shafts, etc. Prehardener solution filter ■ Precision Filmline Venturi air squeegee prior to drybox entry ■ Air vent on prehardener ■ Solid state variable speed D.C. drive main motor ■ Bottom drains and valves on all tanks ■ Extended development time up to two additional camera stops at 50 FPM ■ Pump recirculation of all eight solutions thru spray bars ■ Temperature is sensed in the recirculation line ■ All solutions temperature controlled, no chilled water required ■ Built-in air compressor ■ Captive bottom assemblies assure you constant footage in each solution ■ Change over from standard developing to extended developing can be accomplished in a matter of seconds ■ Impingement dryer allows shorter put through time.

Partial listing of Filmline Color Installations: — NBC- New York, NBC- Washington, NBC- Cleveland, NBC- Chicago, CBS & ABC Networks, Eastman Kodak, Rochester.

Laboratories: De Luxe Labs, General Film Labs (Hollywood), Pathe-Labs, Precision Labs, Mecca Labs, Color Service Co., Capital Film Labs, Byron Film Labs, MGM, Movie Lab, Lab-TV, Technical Film Labs, Telecolor Film Labs, Guffanti Film Labs, A-One Labs, All-service Labs, NASA Cape Kennedy, Ford Motion Picture Labs.

TV Stations: WAPI-TV, KTVI-TV, WXYZ-TV, WTPA-TV, WBTV-TV, WEAT-TV, WMAL-TV, WSYR-TV, WDSU-TV, WVUE-TV, WJXT-TV, WTOP-TV, WAVY-TV, KTAR-TV, WTVR-TV, WFBC-TV, WMAR-TV, WCKT-TV, WAVE-TV, WCPO-TV, WAPA-TV, WCIV-TV, WJIM-TV, WWL-TV, KYW-TV, KETV-TV, WNBQ-TV, KSLA-TV, WSAZ-TV, WHP-TV, WHCT-TV, WTWO-TV.

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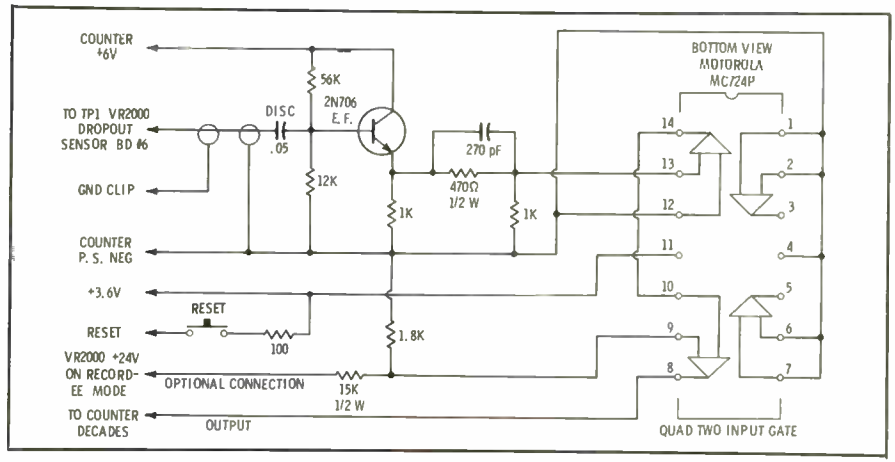
Circle Number 23 on Reader Reply Card

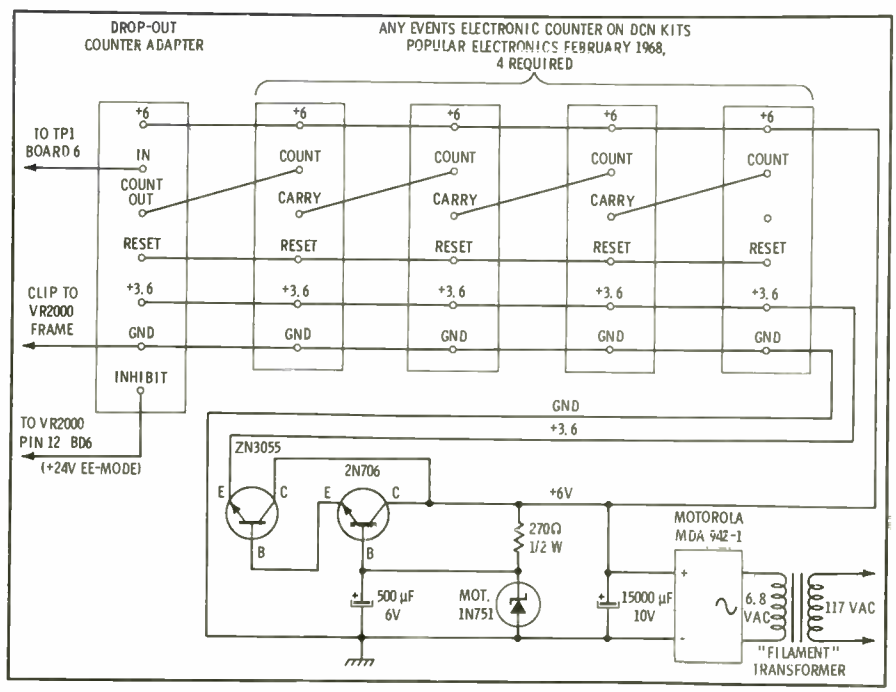
ENGINEER'S EXCHANGE

Television Tape Counter

The number of dropouts on a television tape playback can be counted without using a picture monitor by constructing an electronic counting unit. Much of the necessary dropout circuitry for this unit is found in board #6 of the Ampex VR-2000. An adapter unit may be connected to a front panel test point on this board without affecting the normal operation of the recorder. During playback, digital counting units total dropout pulses appearing at this tesst point (TP1) and at the end of the playback, the total may be noted.

The dropout circuitry in a VR-2000 is normally set to trip when the recovered RF drops 20 db below normal. When the dropout exceeds this figure, a pulse is generated in Q17, 18, 18 and shaped by





a Tunnel diode in board #6 for use in another module. The same pulse is available at TP1 with a peak to-peak amplitude of 12V.

An adapter unit containing an emitter-follower may be constructed on a small piece of perforated board to translate this pulse to RTL digital logic levels and to prevent excessive loading of the test point. The frequency response of the decades extends past 8 MHz permitting the counter to record any dropout that occurs.

The complete circuit of the adapter board also includes an inhibit circuit which may be connected to the recorder EE-Record 24V bus at pin 12, bd. #6, to prevent counter action when cal pulses are present during standby. This connection is not essential, since the counter may be easily cleared with the reset button at the start of any tape playback.

The availability of counter decade kits complete with printed circuit boards simplified the construction of this unit. Four decade units should be used and may be mounted at one end of a 4x7x12 minibox complete with input jack, reset button and power supply. A regulated supply is shown in Figure 1 since such a circuit may be assembled inexpensively and will give better results than an unregulated supply. It should be possible to build the complete unit for less than $75.

Bert Kelley
WFLA-TV, AM, FM
Box 1410
Tampa, Fla.

NEW PRODUCTS

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

Building the Heathkit SB-620

The new Heathkit SB 620 Scanalyzer is a unique unit that has a number of applications in commercial, non-commercial and amateur radio service. Designed basically as an instrument capable of displaying signals in a bandwidth range of from 10 to 500 kHz, the unit has many other uses.

Aside from acting as a spectrum monitor, the Scanalyzer can be used to check oscillator stages for harmonic levels. And it will detect and display parasitics. It also can be used to check mixer stages for signal and oscillator feedthrough and mixer products. It can even be inserted to check for linear amplifier distortion products. In fact, the unit is capable of displaying two RF signals on the screen at the same time.

Both variable and fixed sweep widths are provided. The variable sweep width mode provides up to 500 kHz of band width presentation (150 kHz maximum when wired for 455 kHz IF systems). The 10 kHz and 50 kHz fixed, narrow-band sweep widths permit slow speed, high resolution signal analysis. At these reduced sweep widths and slow sweep rates, this unit can resolve equal amplitude signals down to 1 kHz separation.

The Scanalyzer can be used to provide a check for out-of-band operation (amateur), to aid in locating spurious transmitter radiation, for carrier null adjustments, and for measuring unwanted sideband.

Other features include a fast sweep pushbutton switch for the 10 and 50 kHz preset slow-sweep rates, a —20 dB Log switch position for an additional 20 dB of attenuation in the IF system to permit a full 60 dB dynamic range, and a 20 dB attenuation switch for test signal input.

When BE constructed the kit, only two problems came up. The first showed up in routing the wire bundle that runs between the black and white capacitors in Fig. 2. Care must be taken to assure that breakout wires are headed toward the terminal boards. Look ahead and press the leads down and toward their connecting points. Otherwise, the soldering will go smoothly until you get to the middle of the bundle. If the bundle has been rotated 180 degrees, some of the wires will not reach their connecting points and the entire bundle must be moved. This may mean rewiring the first several leads.

After several hours on the bench, we found it nearly impossible to get the maximum sweep rate. The gremlin was a NE 85 neon lamp. Since there is another NE 85 that is used as an Off-On indicator, we simply swapped the two and the maximum sweep rate was easy to achieve. But it should be remembered that these neon lamps must be aged before it is assumed they are not working correctly.

An experienced builder has wiring ideas of his own. In some cases, he can improve slightly on the kit design. But when it comes to cutting wire bundle and cable leads, the manual must be followed. The leads to the CRT base seemed too long, and we cut them slightly. After all the wires were soldered, the CRT base leads were short enough to keep the CRT from fitting properly into its holder. The leads were routed in alternate paths to allow slack, and the problem was eliminated. However, we were dangerously close to needing a new set of leads.

Kits have a tendency to include wire lengths that are in excess of that which is best for optimum circuit operation. In most cases, wire trimming should take place after the unit has been completed. When you think you've made a nifty shortcut, you may find that the move will complicate the placement of other parts.

Whether planned for use in commercial, non-commercial or amateur stations, the SB 620 can remain in operation for extended periods of time. The case is well ventilated, allowing minimum unit operational temperatures.

Like so many other basic test instruments, we suggest the unit be inserted at some point and used daily. Too much costly test equipment sits on the bench waiting for an emergency or a "proof" assignment.

Circle Number 69 on Reader Reply Card

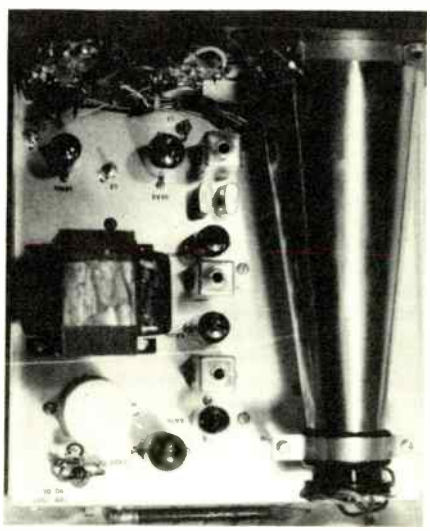


Fig. 1

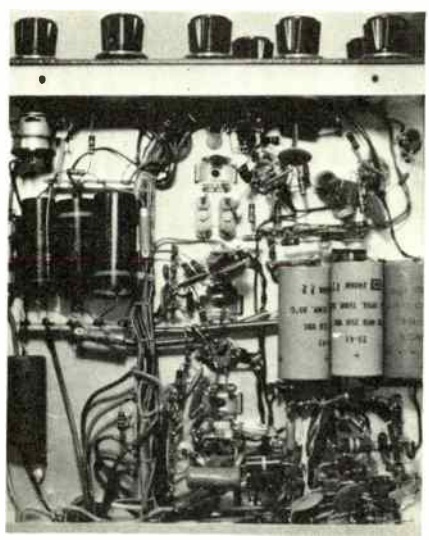


Fig. 2

The Two-Way Microphone

Similar to a two-way speaker system, the total response range of a two-way microphone has been subdivided between a high frequency and low frequency transducer with the cross-over at 500 Hz.

The basic principle is ideal. It took the electro-acoustical competence of AKG to make it possible. It represents the most significant advancement in cardioid dynamic microphones.

The results are performance characteristics formerly unobtainable in cardioid dynamic microphones.

In practical terms this means:

- Natural, objective recordings without discoloration of sound reaching the microphone off-axis.
- More gain before feedback.
- Greater intelligibility and "reach" without deterioration of signals reaching the microphone off-axis.
- Because of elimination of proximity effect there is no rise in bass response to cause feedback or loss of clarity.

Illustrated is the D 200 E, adjacent to its components. Suggested retail net $69. Write for complete technical description of all **AKG** Two-way Microphones. AKG-29

*U.S. Patent #3,204,031

MICROPHONES • HEADPHONES

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Circle Number 26 on Reader Reply Card

NEW PRODUCTS

Audio Console

A solid-state audio console, the Yard II, that offers a wide range of operational facilities in a compact, space-saving package has been introduced by **Gates Radio Company**, division of **Harris-Intertype Corporation.**

Just over a yard wide (38 inches), the console features twelve inputs into eight mixing channels, and two unwired utility keys to give the broadcaster greater operational flexibility. The Yard II is a full control facility for any size AM and FM monophonic stations. It can also serve as a sub-master control or production console for larger operations.

Any of the eight input channels may be switched to either the program or audition position to permit monitoring or recording of any incoming sources without disturbing programming.

Faders are the reliable open-type step attenuators that can be easily serviced. Mixer knobs are supplied with colored disc inserts to color-code controls by function: red for turntables, or green for studio locations.

Two muting relays are supplied to operate warning lights as well as muting of the control room and studio speakers. A terminal strip on the console permits flexible selections of muting relay operation simply by changing jumper wires.

Except for the externally mounted power transformer, the Yard II is completely self-contained. According to Gates, frequency response of the Yard II is uniform ±1 dB from 30 to 15,000 Hz. Noise is better than 73 dB below normal output with cross-talk below the noise at normal levels and control settings. Distortion is less than 0.75% from 30 to 15,000 Hz at +18 dBm output.

Circle Number 70 on Reader Reply Card

Audio Flutter Meter

An economical new flutter meter, offering professional quality and accuracy has been introduced by **Data Measurements Corporation.**

Designated the Model 8155, the new flutter meter was developed specifically for use in radio and television stations and in critical high-fidelity applications. It provides precise flutter measurements to NAB or DIN standards .

The Model 8155 also provides a precision 3 kHz test frequency, which may be used for recording and reproducing without a standard tape. The instrument has a self-checking feature, and will maintain calibration with measurement consistency between an unlimited number of units.

Operating from reproduce electronics, the 8155 has easily understood front panel controls, making it usable for production line or field service operations. The compact size of the 8155 makes it easily portable. The unit weighs less than 10 pounds.

Circle Number 71 on Reader Reply Card

Further proof... sound has never been in better shape!

RE55 *OMNIDIRECTIONAL DYNAMIC MICROPHONE*

There are plenty of good, functional reasons behind the new look of Electro-Voice professional microphones. Reasons dramatically proved by the rapid success of the Model 635A and the RE15. Now we've added the RE55 to this handsome group.

The RE55, like its predecessor the 655C, is an extremely wide-range omnidirectional dynamic. And in most electrical particulars it is not greatly different. RE55 frequency response is a bit wider, and perhaps a trifle flatter. An impressive achievement when you consider that the 655C has been extensively used as a secondary frequency response standard. Output level is 2 db hotter, and the exclusive E-V Acoustalloy® diaphragm of the RE55 can provide undistorted output in sound fields so intense as to cause ear damage.

The biggest changes in the RE55 are mechanical. For this microphone is even more rugged than the 655... long known as one of the toughest in the business. There's a solid steel case and new, improved internal shock mounting for the RE55. Plus a satin nickel finish that looks great on TV long after most microphones have been scarred and scratched almost beyond recognition.

For convenience we've made the barrel of the RE55 just 3/4" in diameter. It fits modern 3/4" accessories. It also fits the hand (and its length makes the RE55 perfect for hand-held interviews). We also provide XLR-3 Cannon-type connectors to help you standardize your audio wiring. Detail refinements that make the RE55 more dependable, easier to use.

Finally, the RE55 has the exclusive Electro-Voice 2-year *unconditional* guarantee. No matter what happens, if an RE55 fails to perform during the first two years — for any reason — we'll repair it at no charge.

Try the Electro-Voice RE55 today. The more you listen, the better it looks!

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• high fidelity speakers and systems • tuners, amplifiers, receivers • public address loudspeakers
• microphones • phonograph needles and cartridges • organs • space and defense electronics

Electro-Voice®

Circle Number 17 on Reader Reply Card

A SUBSIDIARY OF GULTON INDUSTRIES, INC.

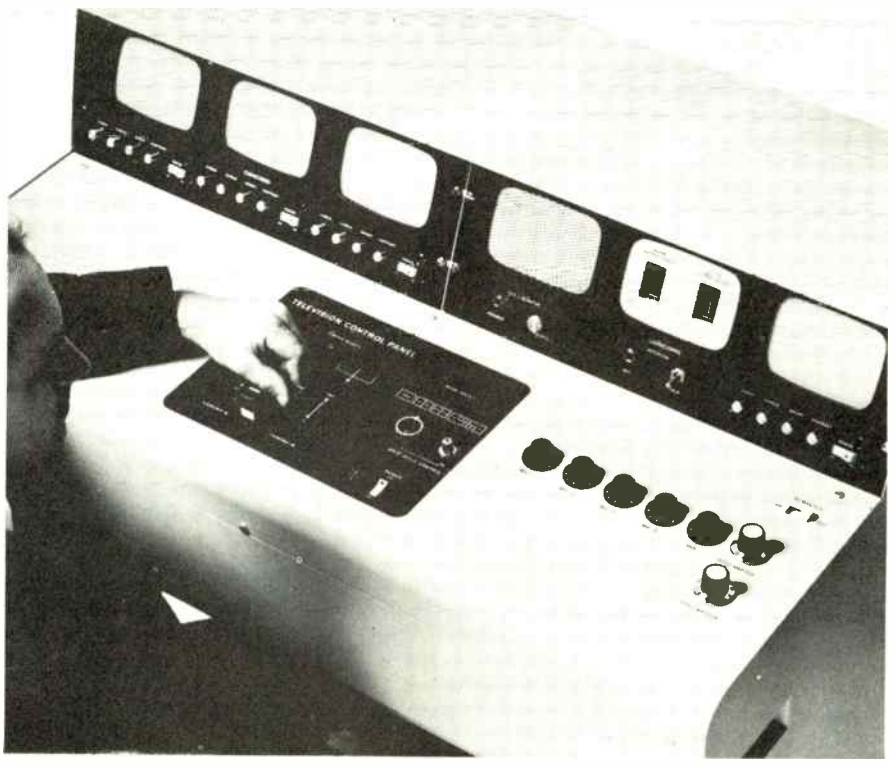
Cable Preamplifier

A new weatherproof UHF antenna preamplifier for use in cable television systems is now available from **C-COR Electronics, Inc.,** State College, Pennsylvania, manufacturers of amplifiers for military, industrial and cable television applications.

Called Model 2202, this compact preamplifier provides single-channel reception for any channel from 14 through 60 with good signal-to-noise characteristics. It has typical noise figures of 3.5 dB to 5 dB with good input match, VSWR 1.5, and 18 to 23 dB gain, depending on channel.

Model 2202 with 75 ohm impedance for standard television channels measures only 3⅝" x 6½" x 2½" and is packaged in a pressure-tight, weatherproof aluminum housing.

Circle Number 72 on Reader Reply Card



TV Console

A television control console, custom-designed for video tape applications has been introduced by **Concord Communications Systems,** a division of Concord Electronics Corporation.

Designated as the Model TCC-100 series, the new consoles represent the first complete, compact system designed for industrial and educational applications for less than $3000.

The new "package" system may be used with any video tape recording system for professional studio quality recording capabilities. It includes such features as: three preview video monitors, a composite monitor, built-in switching and special effects panel, five audio inputs, built-in speaker for monitoring audio, recording VU meters, operator-to-cameraman communication provisions and master audio and video controls.

Subject matter from up to three cameras may be recorded with selected audio material, background music effects, titling and assorted special effects as desired.

Circle Number 74 on Reader Reply Card

Distribution Amp

The new **Vikoa** Model 5410 solid power series amplifier features a 30 dB gain high performance, solid state primary distribution makeup, true modular construction on glass (Military grade) substrates, plus a breakthrough in noise figure. The unit is capable of being directly driven from an antenna, and provides full coverage for low band TV channels.

Generous ratings have been made throughout, allowing cascaded operation, long life, and little or no maintenance. Provision is made for screw driver adjustment of independent high band and low band gain controls which provide ease in reaching the farthest outlet with compatible levels.

An aluminum extrusion provides the housing for the modular amplifier. Cast end bells provide rail type mounting which, coupled with a low profile, provide convenient mounting in the most inaccessible locations.

Circle Number 75 on Reader Reply Card

Deviation Meter

Measurements, Boonton, N.J. announces the availability of their new Model 140A, standard deviation meter and standard test receiver.

The new instrument, completely portable and designed to measure accurtaely the peak freqeuncy deviation of FM communications transmitters is specially suited for lab use and mobile radio servicing. Deviation meter contains accurate, linear, counter-type discriminator and degenerative voltmeter. Stable conversion oscillator permits measurements to 1000 MHz with 3% deviation accuracy. Easily standardized without accurate FM source or requirement for Bessel-null techniques.

Output system includes 750 micro-second de-emphasis network to permit use as a standard test receiver meeting EIA Standard RS-152-A, enabling simple measurements of noise, distortion and audio frequency response on transmitters. The network may be switched out of the circuit when not required. Front panel phone jack for convenient monitoring. Meter has direct reading ranges of 0-5 kHz and 0-20 kHz.

Circle Number 76 on Reader Reply Card

Automatic Programmer

Two part-time program automation systems designed for specific programming needs of broadcasters not yet ready for full-time automation are available from **Gates Radio Company,** division of **Harris-Intertype Corporation.**

One system uses reel-to-reel machines for audio reproduction and is especially suited to broadcasters that offer a wide range of music in their programming. Tape cartridge units are featured in the other system for stations having a limited number of chart selections. Both systems come in monaural and stereo.

At many AM and FM stations, night-time and weekend schedules lend themselves to some part-time automated periods. The change to part-time automation has these advantages: Use of "quality" voices during non-traffic periods, relief for a lone operator who also must handle news and production, and main-

tenance of "on-air" production quality with part-time and inexperienced personnel.

Status lights indicate the exact position of automated programming at a glance. Last minute program changes can easily be made at air time on the systems' SC-48 programmer. Each system has the capacity for five additional inputs for future expansion.

Circle Number 77 on Reader Reply Card

Instructional TV

A new 2.5 GHz instructional television transmitter modulator, Model SE-1, has been developed by **Micro-Link Systems/Varian Associates** of Copiague L.I., New York.

Available in one, two, three or four-channel configurations, the new equipment provides automatic gain control for both audio and video inputs, thus eliminating the need to continually adjust levels, or to purchase extra processing equipment.

The Model SE-1 solid state exciter accepts standard audio and video inputs, and develops a TV signal on any of the VHF high-band channels. The output is used to drive a 2.5 GHz ITFS transmitter or a cable distribution system.

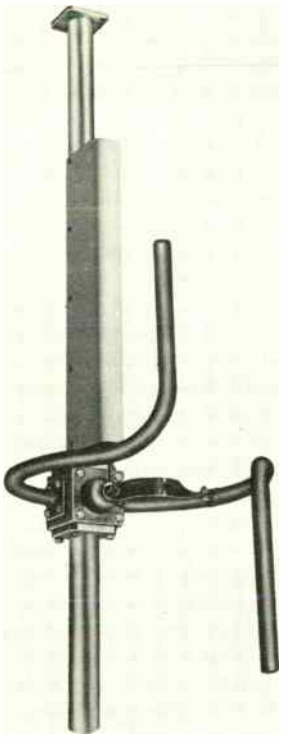
Circle Number 78 on Reader Reply Card

"HAVE THOSE ASTRONAUTS SPASHED DOWN YET?"

Low Power Antenna

A Class "A" circularly-polarized FM antenna having all of the electrical advantages of a high-powered heavy-duty FM antenna but designed to handle low power inputs for less cost to Class "A" FM stations, has been introduced by **Gates Radio Company,** division of Harris-Intertype Corporation.

Constructed of rugged brass elements, the antenna is available in configurations up to and including six bays at power inputs up to five kilowatts. It can also be supplied with null fill and beam tilt, used for the most part on higher power installations. The antenna is pre-tuned to the station's operating frequency before it is shipped from the factory.



The low-silhouette configuration of the antenna results in minimum wind-loading. For de-icing, two 150-watt stainless steel heating elements per bay are available as optional accessories. They are factory installed and replaceable in the field.

Circle Number 79 on Reader Reply Card

Lighting

Berkey-Colortran, Inc. (a Division of Berkey Photo, Inc.) announces the availability of a complete line of PAR 64, 1000W "quartz" lamps in 3 200°K, 3400°K and DAYLIGHT color temperatures. The PAR 64 lamps, with a range of beam patterns from narrow spot to wide flood, meet the creative needs of the cinematographer, lighting director and the still photographer.

The recently introduced Color-Tran Maxi-Brute "6" and the new Cine Queen II are fixtures utilizing the PAR 64 for a variety of lighting applications. The Cine Queen II, an ideal motion picture and television location light, is also suitable for photo instrumentation and high speed photography. The well ventilated construction allows for continuous duty operation.

The Cine Queen II can be stand mounted or supported by standard grip equipment. Specially designed specular or diffuse intensifiers are available which increase the intensity and efficiency performance of the fixture. Other accessories include four leaf barndoors, scrims, dichroic daylight conversion filters, heat filters and diffusion glass.

The stand model weighs only 9 lbs. and incorporates a cast aluminum yoke with an integral mounting bracket. The hanging model, weighing 5½ lbs., is equipped with a C-clamp for mounting on an overhead grid.

Circle Number 80 on Reader Reply Card

FET Choppers

Three new FET choppers, 2N4391, 2N4392 and 2N4393 have been introduced by National Semiconductor. These devices feature a fast switching time of 15ns (typical) and low leakage of 10 pA maximum.

National offers the potential users of these devices two features, high reliability and immediate availability. This series of FET's offers optimum performance in micro-volt amplifiers and meters, multiplexers, commutators, TV equipment, oscilloscopes, AM and CB receivers.

Circle Number 81 on Reader Reply Card

Mixer Amplifier

Altec Lansing announces the introduction of a new silicon transistoribed mixer amplifier, Model 1589A, designed for recording studios, theatres, schools, broadcast studios and PA system application. A rugged, compact unit measuring only 1¾" H by 4¾" D in a standard 19" rack mount, it is powered by a self-contained 120/

Continued on page 65

In South America

17 Country Network Planned

A telecommunications network linking all the South American countries and five in the Caribbean area has moved one step closer to execution. An agreement signed by the participating countries, the Inter-American Bank and the United Nations Development Programme provides for feasibility studies of requirements for installing the international connections required to link the individual systems of each of the countries.

The studies will serve as the basis for the preparation of individual construction projects for the network and will facilitate the financing of such projects.

Specifically, the studies will seek to:

—Recommend the best and most economical means, including the use of satellites, for interconnecting the national segments of the network and its international switching centers.

—Propose alternate routes between international switching centers.

—Recommend facility and circuit requirements for each of the services to be provided by the network, such as telephone, telegraph, telex, data transmission, facsimile, sound and video programs.

—Estimate the probable growth of the different services for the next five and ten years and make recommendations on future circuit requirements.

—Make suggestions on model agreements between governments for the implementation of the interconnections.

The studies will also recommend the adoption of standard procedures for collecting and processing statistical data needed to plan future expansions; lay down principles for calculating tariffs and rates; draft guidelines for the division of tolls and expenses; make suggestions on settlement currencies and procedures for settling accounts and propose uniform standards for the maintenance, operation and organization of network control centers.

The interconnection of the various national segments will be achieved through a combination of microwave stations, submarine cables and satellites. The new system will provide telephone, telex and telegraph services and television and radio broadcasting channels.

The participating countries are Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Haiti, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela. The system will also be linked to those systems in Mexico and Central America which are currently under construction.

Fairness Rules

The National Association of Broadcasters asked the Federal Communications Commission for a 90-day extension of the deadline for filing comments on FCC's proposed rules concerning fair employment practices in the broadcast industry.

NAB said the proposed rules are "quite detailed and contain many items calling for specific comment," and that more time is needed "for a thorough evaluation. . ."

In the filing, Douglas A. Anello, NAB general counsel, and John B. Summers, assistant general counsel, said the proposals can be expected to affect stations of different size and geographical location in different ways and "it is important that we consult with as many diverse member stations as possible."

Since such communication with member stations would be time-consuming, especially in the summer months when many station personnel are on vacation, NAB feels a time extension is necessary.

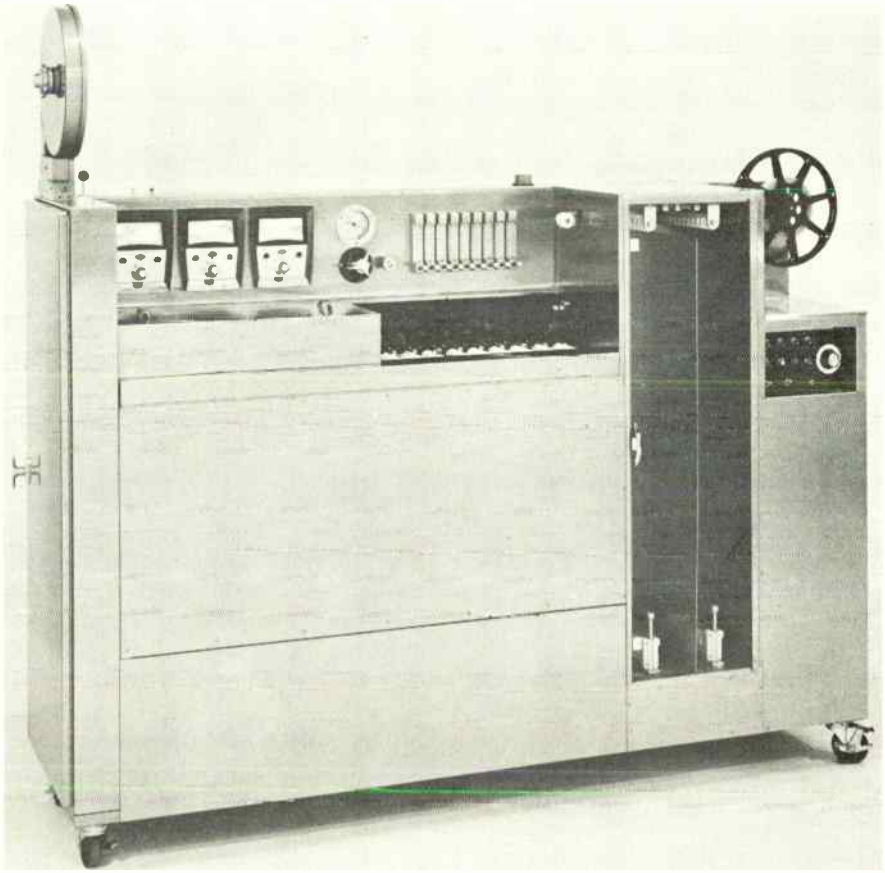
It said the present August 4, 1969 filing date should be extended 90 days.

Noting that broadcast licensees are members of a medium having an extensive influence on American life, NAB said it is "fully cognizant of the need to implement the national goal of assuring equal opportunity in employment."

240 VAC supply or may be operated from a 24/28 VDC battery, negative ground.

Power output is +20 dBm, with a frequency response from 30 to 20,000 Hz, ± dB at line level output. The unit has two inputs, position #1 is low impedance (150/250 ohms) and #2 position is high or low impedance based upon plug-in transformer selected. Independent gain controls are provided for both inputs. Output is 150/600 ohms, with the Altec 15095 plug-in line transformer, used to provide isolation between the mixer buss and high level inputs. Power output is +18 dBm at less than 0.5% total harmonic distortion, 20 to 20,000 Hz., and less than 1.0% from 30 to 20,000 Hz at +20 dBm. The new Altec mixer amplifier thus exceeds all requirements for broadcast and recording studios where sophisticated systems demand top performance.

Circle Number 82 on Reader Reply Card



Film Processor

Terminal Data Corporation has announced the availability of the ColorMate ME-4 16/15 processor for the Eastman Kodak Ectachrome 16mm color film.

The ColorMate 16/15 operates at 15'/minute. ColorMate claims features include easy installation, operation, reliable performance, and minimum maintenance. ColorMate construction incorporates a stainless steel frame and corrosion resistant PVC tanks. Quick disconnect stainless steel side panels permit easy access to all components. ColorMate is only 79" long. Integral operating controls and the compact size minimize space requirements.

Circle Number 83 on Reader Reply Card

Modulation Meter

The type AFM2, AM/FM Modulation Meter features solid-state circuitry and line or battery operation. This instrument is wide range in both the carrier frequencies covered (5 to 1002 MHz) and the modulation frequencies accepted (0 to 200 kHz). It handles complex modulation patterns such as FM telemetry signals up to 200 kHz and stereo signals, for which it features a L/R separation greater than 46 dB.

Full scale measurement ranges include 3, 10, 30 and 100% for AM modulation depth and ±3, ±10, ±30, ±100 and ±300 kHz for FM peak deviation. Positive and negative deviation peaks can be measured separately. The input signal level necessary for full sensitivity is 3 mV in the carrier frequency range from 5 to 200 MHz, 20 mV from 200 to 600 MHz and 30 mV from 600 to 1000 MHz. Measurements of incidental FM on AM signals and residual AM on FM signals are readily accomplished due to the very small amount of residual modulation generated in the meter proper.

The AFM2 has many applications in the measurement of FM and AM modulation levels of RF generators, fixed or mobile transmitters, telemetry and multiplex stereo signals.

Circle Number 84 on Reader Reply Card

Piezoelectric Mic

A new, one-inch diameter piezoelectric microphone from **B & K Instruments, Inc.,** boasts very high capacity for use with long connection cables and low impedance amplifiers.

Offering frequency response from 3 Hz to 100 kHz wtih the lower limit adjustable, the low cost microphone's dynamic range extends up to 140 dB sound pressure level.

The Model 4117 can be mounted in restricted space and has front end equalization for installation flush with ducts or walls. It is designed primarily for use with B & K sound level meters, but will find application as a high quality, low cost measuring microphone in sound distribution compensating systems in theaters, public address systems machinery monitoring systems in factories and power plants, or anywhere a small, high capacity measuring microphone is required.

The microphone's high capacity means that amplifier input impedance need not be large. Relatively long connection cables between microphone and preamplifier produce no significant loss of sensitivity.

Circle Number 85 on Reader Reply Card

Tunable Filters

Texscan Microwave Products Corporation has introduced the VF series of tunable bandpass filters. The frequency range of the VF series is 50 MHz to 4000 MHz with any single model covering more than an octave.

The VF series is available with either a three or five section response and has a 3 dB bandwith of 5%, insertion loss from 0.2 dB to 1.5 dB, and VSWR less than 1.5:1.

The tunable bandpass filters are housed in an aluminum case. An engraved dial calibrated in frequency indicates the center frequency of each filter response with resetability.

Circle Number 86 on Reader Reply Card

Chroma Demodulator

Television manufacturers can now improve the quality of color TV reception by designing with a new **Fairchild** Semiconductor chroma demodulator, which provides an extremely low voltage output drift through all operating temperature conditions including the initial "warm-up."

Fairchild's new product entry is the μA746E, a silicon linear integrated circuit characterized by a drift of only .3 mV per degree centigrade. This unique tolerance allows designers to achieve high performance by the use of economical direct-coupled chrominance output.

Circle Number 126 on Reader Reply Card

Volume Indicator

A radically new design in volume indicators has been introduced by **Altec Lansing,** a manufacturer of professional broadcast and recording equipment.

Designed to replace the old-style VU Meter, Altec's new volume level display is a peak reading device containing a vertical array of seven lights. Designated 9713A, the display occupies less than one inch of width, allowing up to 24 displays to be easily arranged in less than two feet of panel space.

According to Arthur C. Davis, vice-president, Audio Controls and designer of the display, "The conventional approach of monitoring console outputs cannot be effectively used when modern sound reproduction techniques require eight, sixteen or, on many occasions, twenty-four channel recordings. This new Altec volume level display answers these multi-track monitoring problems by providing a volume indicator device that is virtually instantaneous in following the audio envelope. It is very simple for the eye to follow a multiple array of color lights as opposed to watching many meter needles."

The Altec VU indicator is calibrated in modulation percentages, 6%, 16%, 25%, 40%, 63%, 100% and overload, using respectively blue, four green lights in stepped succession, yellow and red. The unit measures 1" (W)x 4½" (H) x 3½" (D).

Circle Number 87 on Reader Reply Card

Spectrum Aanalyzer

The **J-tec Corporation** has announced the availability of their new line of CATV spectrum analyzers.

CableScan I and CableScan II are specifically for CATV. Both units offer input sensitivity and stability for scope-screen display of carriers within the CATV spectrum of 50 to 220 MHz.

CableScan I is designed for use with virtually any existing oscilloscope (which provides the display). Interconnection to the scope is

INDUSTRY CALENDAR

SEPTEMBER

12-14 The Maine Broadcasters Association will host an annual fall meeting at Sebasco Lodge, Sebasco Estates.

17-19 The fall convention of the Michigan Association of Broadcasters will be held at Boyne Highlands, Harbor Springs.

18-20 The Group on Broadcasting of the Institute of Electrical and Electronics Engineers will sponsor a broadcast symposium at the Mayflower hotel in Washington.

23-25 The Pennsylvania Community Antenna Television Association annual fall meeting at the David Mead in Meadville.

24-25 CBS Radio will host its 16th annual affiliates convention at the Waldorf Astoria hotel in New York.

26-27 The Tennessee Cable Television Association will meet at Howard Johnson's motor inn in Gatlinburg.

26-27 The Utah Broadcasters Association will sponsor its annual fall meeting at the Roadway Inn in Salt Lake City.

28-30 Annual fall meeting of the Nebraska Association of Broadcasters at the Holiday Inn in Grand Island.

28-Oct. 3 106th technical conference and equipment exhibit will be sponsored by the Society of Motion Picture and Television Engineers at the Century-Plaza hotel in Los Angeles.

OCTOBER

1 New deadline for reply comments on part five of the FCC's proposed rulemaking dealing with CATV policy. The previous deadling was Aug. 14.

1- 3 Annual fall convention of the Tennessee Associtaion of Broadcasters at the Sheraton-Peabody in Memphis.

11-12 Texas Association of Broadcasters annual fall convention at the Koko and Villa inns in Lubbock.

13-15 Kentucky Broadcasters Association will host a fall convention at the Phoenix hotel in Lexington, Ky.

18-21 Annual fall convention of the Carolina Association of Broadcasters at the Robert E. Lee hotel in Winston-Salem.

20-23 The Electronic Industries Association will sponsor a fall conference in Los Angeles.

22-24 Annual fall convention to be sponsored by the Indiana Broadcasters Association at the Sheraton hotel in French Lick.

23-24 The Ohio Association of Broadcasters will host their annual fall convention at Neil House in Columbus.

29-31 The Illinois Association of Broadcasters will hold its annual fall convention at the Drake-Oarbrook hotel in Oakbrook.

through a three wire cable (provided) to the vertical and horizontal posts.

CableScan II has the identical spectrum analyzer found in CableScan I, plus its own solid state (except for CRT) display system. Both units have simplified operating controls, designed to make spectrum analyzer use simple and straight forward for the CATV technician or engineer.

Input sensitivity—Minus 35 dbmv input signal provides 6 dB signal plus noise to noise display, low band; minus 300 dbmv high band.

Frequency range—50 to 220 MHz, continuous coverage includinng mid-band, with optional frequency extender available to cover 5-50, 220-300 MHz.

The display dispersion is 20 MHz maximum display, continuously adjustable down to 500 kHz (i.e. displays up to three TV channels—18 MHz—simultaneously, or the entire FM band from 88 to 108). Color sub-carrier, FM SCA channels are clearly displayed in log display mode.

Circle Number 88 on Reader Reply Card

Wide Angle Lens

An extreme wide angle lens for Vidicon television cameras has been announced by **Angenieux Corporation of America.** The 7.5 mm f/1.9, designated the R7, has a 94° field angle (on a .625″ image diagonal). At a distance of only 3 feet the field covered is 3′4″ x 4′8″.

Considering the very short focal length and the large aperture, this lens is amazingly compact. With a total length of only 3.70 inches (measured from the image plane) and a maximum diameter of 3 inches, this lens weighs 14 ounces.

Because of its unusually great depth-of-field, the R7 is supplied with a fixed focus "C" mount. At full aperture, a sharp image is obtained of all objects between 20 inches and infinity. Distortion is corrected as well as all other aberrations. The quality over the entire field is really exceptional for such a wide angle lens.

Circle Number 89 on Reader Reply Card

Total Cost of FCC Studies For 1969 Will Exceed $450,000

More than $450,000 will be paid out by the FCC in fiscal year 1969 for research and study programs in the communications field. The studies are designed to assist the FCC in solving regulatory and technical policy problems in communications technology.

The major projects contracted for by the Commission as of June 30, 1969 are:

Broadband Communications Technology: Analysis of technical communications developments, their significance and possible impact on existing communications systems. Contractor: Institute for Telecommunications Sciences (Department of Commerce), $50,000.

Mathematical Model of the TV Industry: Computerization of TV industry data to permit projections of future status of the industry to aid in decision making by Commission. Contractor: Leasco Systems and Research Corp., $23,778.

Frequency Assignment Techniques for Microwave Systems: Improvement of frequency utilization by computerization of microwave frequency assignments. Contractor: Communications and Science, Inc., $192,000.

FCC Laboratory—Evaluation of role of Laboratory in Commission with view to modernization of facilities to meet current communications problems. Contractor: A. Earl Cullum, Jr., Consulting Engineers, $38,960.

Stationary Orbit Communications Satellite: Development of methodology for coordinating spectrum utilization of communications satellite systems using geostationary orbit. Contractor: Office of Telecommunications Management, $50,000.

Foreign Attachment Interconnection—Definition and evaluation of problems involved in interconnection of customer owned voice and data communications equipment and telephone company services and facilities. Contractor: National Academy of Sciences, $28,060.

Citizens Radio Service—Analysis of utilization of the Service to determine how to eliminate abuses and increase usefulness. Contractor: Bureau of the Census (Department of Commerce), $21,600.

The Commission has also contacted for follow-on studies in connection with the land mobile project conducted by Sanford Research Institute, and has arranged for the services of Dr. Hyman Goldin, of Boston University, as a consultant to assist the Commission staff in its study of conglomerates in the broadcast field.

All keyed up

By Don Hiles*

Have you ever arrived at work thinking, 'It's gonna be a great day?' All I have to do is unlock the door, turn on the rig, get her on the air.

Here is the tale of one engineer we'll call Chief. (Chief is standing at the front door of the station observing his reflection in the glass door. He has just realized he has forgotten his key.)

5:30 a.m.

Only 30 minutes 'til air time! What am I going to do? There must be something? I know! I'll go down the roads to Bill's Gas Station and call the announcer. That's it.

5:32 a.m.

Hey Bill! Give me change for a quarter. Got to make a phone call. What's Jack's number 242—uh . . . 6924 . . . ring, ring, ring, ring. Why doesn't he answer? Got it! He's at the hospital. His wife's due any day now.

Chief: Hello Operator . . . get me Sunnyside Hospital.

Operator: Is it an emergency?

Chief: You better believe it! My friend's wife is due . . .

PBX: Good Morning, Sunnyside Hospital—May I help you?

Chief: Give me the Delivery . . . er . . . Admitting Office!

PBX: Thank you . . . One moment please.

Admitting: May I help you?

Chief: Has a Mrs. Jack Smith been admitted in the past few hours?

Admitting: No. We have no one here by that name sir.

Chief: Thanks.

5:35 a.m.

I'll bet he's at the station by now? Why of course. It's 25 'til 6. He has to be there now! Good thinking, Chief.

(Chief zooms back to the station.)

5:37 a.m.

He's not here! Think, man, think! What's left? Why did I have to forget that key? Where could it be? It's in yesterday's trousers! Sure. What took you so long Chief? What time is it?

(Chief hops into his car and pushes the accelerator to the floor. Sixty, seventy . . . four minutes later he arrives at the apartment.)

5:41 a.m.

Where are those trousers? In the clothes hamper. Sure! Where else. Nope, not there! Hurry! I kicked them under the bed. Why of course! I always do that. I'm not thinking straight.

Take it easy . . . keep calm. They are not under the bed. That's strange. Try the living room Chief. They couldn't be in there. Better look anyway. They always say, 'If you've lost something, look in the most unlikely places.'

Then, charging through the garage, Chief finds the crumpled trousers atop a pile of clothes he was about ready to set out for a welfare pickup truck. With keys in hand, Chief exits the garage, but only after catching a belt loop on a nail at the side of the garage doorway. (Looking over Chief's shoulder as he crashes through the tulip bed, you must agree bad luck comes in bunches.)

(Sixty, seventy, on the way back to the station.)

5:49 a.m.

Hustle Chief . . . you've gotta warm that rig up! Of all places to find a pair of pants. I don't remember putting them there? This business is gettin' me down. Talk about needin' a vacation!

(The Chief slides sideways into the gravel drive leading to the station. Whew! Then, he spots Jack's car in front of the building.)

5:54 a.m.

Watch your temper Chief. He's here! All this over one lousy key.

(The Chief stops amidst a cloud of dust in front of the station, gets out of the car, places his hands in his pockets. He casually strolls toward the station entrance where Jack is standing in the door.)

5:55 a.m.

Jack: I didn't think you were going to make that turn Chief! What happened?

Chief: Wasn't much. My foot slipped off the brake and hit the accelerator. Got any donuts?

Jack: Yeah, sure.

*WCKY, Ft. Mitchell, Ky.

TV Camera Is 'On the Beam'

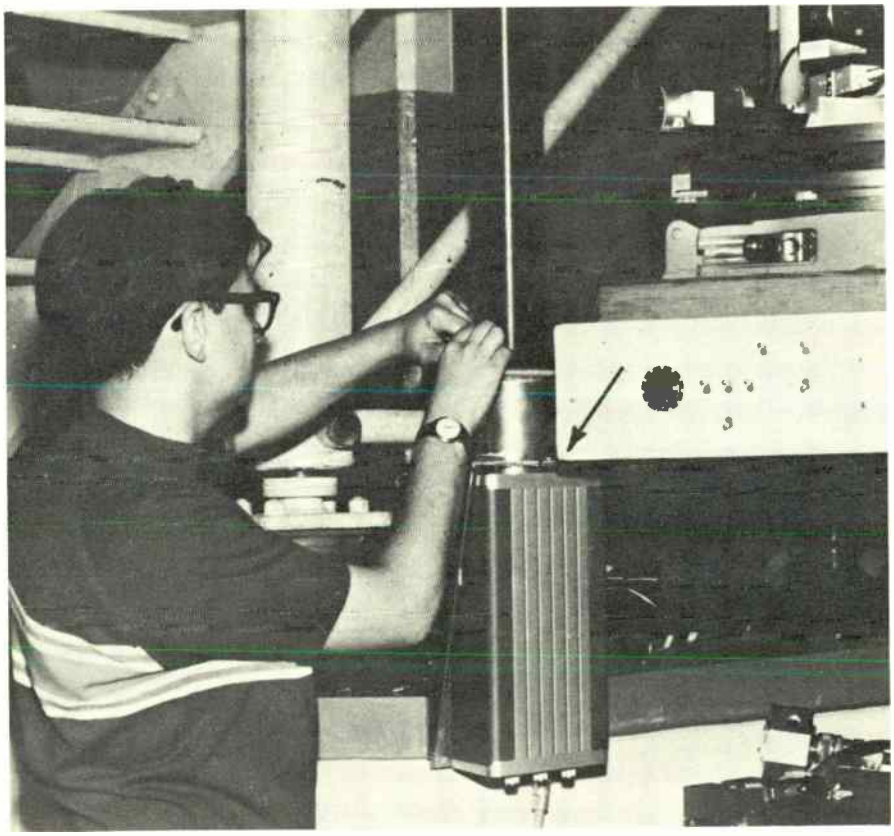
To give scientists more precise data on measurements such as distance between the earth and the moon, a 20 hundred million watt laser beam was fired from Lick Observatory to reflectors set up by astronauts on the moon and bounced back to earth. The laser beam was fired through a 120 inch reflecting telescope at Lick Observatory on Mt. Hamilton, operated by the University of California at Santa Cruz.

Because the laser is so powerful and could accidentally misfire, no one can look directly into the telescope during the set up period or during firing. To properly sight the unmanned telescope and watch the performance of the laser, scientists replaced the human eye with a television camera mounted on the telescope.

The camera, supplied by Telemation, serves a dual purpose—the astronomers can safely sight the telescope and television networks can pick up a flash of light which will appear on the camera picture (the light will appear to be coming from the surface of the moon, but will actually be coming from a small reflector mounted on the telescope and used to collimate the optical system).

Television station KQED, San Francisco, was available to feed the video picture to the networks from a mobile van stationed outside the observatory. KQED, using TeleMation equipment, was set up as a pool feed point for all three networks.

Astronaut Neil Armstrong placed a unit on the Lunar surface consisting of 100 one and one-half inch reflectors. Scientists and astronomers from Lick Observatory then shot impulse type laser beams at speed of 10 nanoseconds, fired at 30 second intervals to the moon reflector. The exact, high speed signals from the laser beam and their subsequent bouncing off the moon and returning to earth will enable scientists to determine within inches, the distance of the earth from the moon, the exact diameter of the earth and the moon and rate of continental drift.



Arrow indicates TeleMation camera.

TECHNICAL DATA

For further information, circle the product identification number on the reader reply card.

100. **ALCO ELECTRONIC PRODUCTS, INC.**—A twenty-page catalog features an expanded line of miniature electronic switches and keyboard assemblies. Included are five lines of toggle switches, an illuminated push button switch, reed actuated keyboard assemblies and push button module sections. Electrical specifications, dimension drawings and prices are listed.

101. **BEECHWOOD MANUFACTURING CO.**—A new four-page brochure covers a complete line of multi-purpose instrument cabinets. The cabinets come in 32 basic sizes. The brochure includes dimensions, prices and choice of colored vinyl.

102. **CHERRY ELECTRIC PRODUCTS CORP.** — A complete line of switches is described in a switch selector guide. Sixty-seven types of coil snap action switches and four types of gold "crosswire" contact switches. Photographs, cutaway illustrations, descriptions and specifications are included.

103. **COHU ELECTRONICS, INC.**—A two-page data sheet, 6-362, describes remote controls for closed-circuit television cameras. Block diagrams, photographs and a compatibility table are included to show how remote controls mate with various TV cameras.

104. **ELCO CORPORATION**—The 1969 issue of the circular connector guide describes two enlarged lines of miniature circular connectors conforming to MIL-26482 and MIL-C-26500. The guide contains drawings with dimensions in millimeters and inches, an illustrated reference index and a glossary of circular connector terms.

105. **BELL EDUCATIONAL LABS.**—A four-page bulletin describes a new line of "do-it-yourself" cabinets. Different cabinet sizes and applications are illustrated in the bulletin. The panels of the cabinet are made of vinyl-clad steel. A table gives sizes, descriptions and prices.

106. **GRAYHILL, INC.**—The new product supplement S-305 is a twenty-page bulletin illustrating and describing the company's latest switch innovations. Included are miniature and lightend push button switches and bi-pin lamp sockets. Complete technical data and specifications are given on each item.

107. **ITHACO, INC.**—A four-page brochure on instrumentation for dynamic data acquisition and signal conditioning is available. Tables include low-noise voltage, charge, velocity and seismic preamplifiers and rack-mounted, voltage, charge and dynamic strain and automatic gain ranging instrumentation amplifiers. Data is included on input impedance, frequency response, gain, noise, output, rated load, maximum input signal, power supply and mechanical configuration.

108. **KISTLER INSTRUMENT CORP.**—A pressure transducer which can be "boiled" clean is the subject of a new bulletin. The unit can be disassembled and cleaned by immersion in a heated solvent. Specifications cover performance parameters and available ranges. Dimensional drawings are also included.

109. **PREFORMED LINE PRODUCTS CO.**—An illustrated four-page product data bulletin is available on closures for splices in buried communications cable. It contains specifications and contents of closure kit and accessories. Also available is bulletin SP-

2137 giving step-by-step procedures for applying the closures.

110. **CAM TECHNOLOGY, INC.**—The fifth in a series of technical bulletins is an analysis of parallel curves and cutoff in the generation of cam contours through the use of electronic data processing continuous path numerical control. Useful to engineers responsible for designing or specifying cams.

111. **RCA, ELECTRONIC COMPONENTS**—An updated catalog provides information on commercial and developmental vidicons. Also included is a listing of suggested components for use with different vidicons, a bibliography of articles pertinent to vidicon systems and an expanded replacement guide.

112. **WARNECKE ELECTRON TUBES, INC.**—A high resolution dual gun, electrical signal storage tube is featured in a four-page brochure. Applications to which the tube is best suited are described. Performance charts and tables, electrical data, physical description and dimensions of the tube, operating recommendations and complementary components are included.

113. **GENERAL REED CO.**—Bulletin GR-11 describes the new "300" series of multicircuit relays. The "300" series is a line of small, low profile relays. Included in the two-page bulletin are dimensional drawings, pin and contact diagrams, construction details, features, specifications and options.

114. **AMPEX CORPORATION**—Now available is brochure T-343 describing the Series 404 low noise audio tape for master recording and other critical recording applications and Series 600 audio tape for duplicating and general professional uses.

115. **GARRETT ELECTRONICS AND CABLE CO.**—A revised 36-page catalog lists nine major wire product groups and related products. The categories include military hook-up wire, aircraft wire, coaxial cable, control and instrumentation cable, power and service cable, audio cable, heavy industrial cable and shielded and braided wire and cable.

116. **ROME CABLE**—Cross-linked polyethylene insulated cables for power applications from 2,000 to 35,000 volts are described in a 12-page brochure. The booklet contains specifications of cables for wet or dry applications, including conduit, duct, trough, direct burial and aerial installation.

117. **SCANBE MANUFACTURING CORP.**—A new type of EMI/RFI gasket is described in an 8-page bulletin. The bulletin contains information on materials, basic configurations available, photos of the product and complete descriptions of the different types of gaskets available.

118. **TENNEY ENGINEERING INC.**—A new thermal protection system designed to protect equipment undergoing environmental tests from excessive heat or cold is described

in an illustrated bulletin. The system detects out-of-tolerance high or low temperature conditions and responds with an electrical switching action and a visual and audible alarm. The system is offered in two models.

119. **CONCORD ELECTRONICS CORP.**—A four-page brochure covering the series VTR-620 video tape recorder is available. The brochure also covers the VTR-620A with automatic gain control. Included in the bulletin are applications, features and technical specifications for the two recorders.

120. **BECKMAN INSTRUMENTS, INC.**—A 16-page catalog features a discussion of the need for maintenance programs and provides information on various types of electrical test equipment. The bulletin focuses on insulation tests and operational tests. Reference is also made to the specialized need and equipment for cable testing. Photographs and circuit diagrams are included and full specifications are given for all instruments.

121. **FAIRCHILD SEMICONDUCTOR**—A complete line of standard, off-the-shelf integrated circuits designed for use with all major logics is described in a 54-page brochure. More than 40 compatible current sinking logic building blocks are described along with descriptions of memory circuits, interface circuits and special circuits.

122. **NANASI COMPANY**—A six-page brochure illustrates switches and jacks used in military and commercial applications. The bulletin covers gear mechanisms, plug-in modules, air variable tuning capacitors, telephone switchboards and modules for telephone equipment producers.

123. **CORNELL - DUBILIER ELECTRONICS**—A four-page illustrated brochure describes a line of tubular aluminum electrolytic capacitors, type WRB, which have capacitance values from 1 to 10,000 mfd. with voltage ratings from 10 to 500 VDCW. The bulletin includes a listing of the units and describes the three basic assortments available.

124. **NATIONAL SEMICONDUCTOR CORPORATION**—A TTL integrated circuit specifying guide is available on the 54/74 series. The guide contains power dissipation and propagation delay on 40 different types of circuits.

GET COMPLETE DETAILS

about the products advertised or described in this issue.

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Use Free Inquiry Card.

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PEOPLE IN THE NEWS

All-Channel Legislation Committee Is Announced By NAFMB President Voron

Formation of an All-Industry Committee for Radio All-Channel Legislation was announced by Abe J. Voron, president of the National Association of FM Broadcasters. The committee includes broadcasters representing large markets and small networks, multiple ownerships and independents.

The committee members are Craig Bowers, president, general manager and station manager, KMYR, Denver, Colo.; Alfred E. Burk, general manager, WBAL-FM, Baltimore, Md.; Lynn A. Christian, president, Dawson Communications, Inc., Dallas, Texas; Robert Cole, vice president of CBS owned FM stations, New York.

Joseph Dougherty, exec. vice president, Capitol Cities Board, New York; Elmo I. Ellis, general manager, WSB-FM/AM, Atlanta, Ga.; Edward F. Kenehan, Esquire-Fletcher, Heald, Rowell, Kennehan & Hildreth, Washington; and George A. Keohler, radio and TV division general manager, Triangle Publications, Philadelphia, Pa.

Others on the committee are David C. Kroniger, president, Metromedia Radio, New York; J. T. Lawrence, general manager, Taft FM Group, Cincinnati; Jerry Lee, president WDVR, Philadelphia, Pa.; Gordon McLendon, board chairman, the McLendon Stations, Dallas, Texas; Arch L. Madsen, president, KSL, Inc., Salt Lake City.

Gunther Meisse, vice president and general manager, WVNO, Mansfield, Ohio; David H. Polinger, president and general manager, WTFM, New York; Walter A. Schwartz, president, ABC Radio Network, New York; Harold Tanner, general manager, WLDM, Detroit, Mich. and Abe J. Voron, general manager, WQAL, Philadelphia, Pa.

The committee is working toward the passage of House Bill HR-2113 and Senate Bill S-402. These bills will make it mandatory for all radio receivers manufactured and imported in the United States to be capable of receiving both FM and AM.

Joins NAEB Network

David B. Eccleston, production manager, WAMU-FM Washington, D.C. will join the National Association of Educational Broadcaster's National Educational Radio Network when it moves to Washington from Urbana, Ill. this summer.

Eccleston will be responsible for overseeing all technical and engineering aspects of the network. In addition, he will do editing and oversee the activities of the duplicating processes. NERN provides some 173 affiliated stations with an average of 5-10 hours of high quality tape recorded programs each week. Programs are produced by individual affiliates and numerous other sources, including foreign broadcast agencies.

Eccleston has been an airshow producer for the East Asia and Pacific Branch of Voice of America since 1963. He has also served as producer for WAMU's school radio project, Enrichment Thru Radio.

Assistant Director

Roy E. Fullen has been named Assistant Director of Engineering for Capital Cities Broadcasting Corporation, owners and operators of Television Station WTVD.

Fullen has been the chief engineer at WTVD-TV since 1959 and has been with the engineering department of the Durham Station from the time it went on the air in 1954. He was previously associated with radio stations WTIK and WDUK in Durham.

Up-and-Coming Engineers

Jerald Crusan has been promoted to the position of applications engineer for Jerrold Electronics Corporation's CATV Systems Division, it was announced by **James Forgey,** division manager.

He is responsible for performing tests and evaluation measurements on CATV equipment, as a member of the division's special test and evaluation group. This group is headed by **Bob Bilodeau,** technical director of the CATV Systems and Educational and Communications Systems Divisions.

Crusan is also responsible for developing sophisticated test methods for the special test and evaluation group.

Gregory C. Potter has been appointed Manager and Chief Engineer of WGLS-FM at Glassboro State College, Glassboro, N.J. Potter is the Assistant Director of Educational Media at the college.

N. William Faun, engineering supervisor, has been promoted to engineering manager at Kaiser's WKBF-TV Cleveland. Faun was senior engineer with WKTR-TV Kettering-Dayton and studio supervisor for nine years with Avco's WLW-D Dayton. He joined WKBF-TV as a technician before the station began operations.

Stein Chosen by NAEB To Head MMI Systems

George Stein, systems analyst, Pittsburgh Plate Glass Industries Inc., Pittsburgh, Pa., has joined the staff of the National Association of Educational Broadcasters as director of the association's newly formed Management and Membership Information Systems.

Stein will be responsible for the development of an information gathering, retrieval and dissemination system which will serve the needs of the NAEB, its member stations and the Corporation for Public Broadcasting, which has funded the project. When the information system is operational, the NAEB will be in a position to provide current data projections, statistics, technical advice and other information about all aspects of educational broadcasting to a wide range of government, industry, professional and instructional groups which are in need of such data.

IEEE Council Member

Stuart L. Bailey, vice president of the Susquehana Corporation, has been appointed to the Joint Technical Advisory Council which is under the sponsorship of the Institute of Electrical and Electronics Engineers and the Electronic Industries Association.

WMCA Managing Director

Stephen B. Labunski has been appointed managing director of WMCA radio in New York. He served in a similar capacity at WMCA from 1958 to 1965 and then left to become Executive Vice President in charge of the NBC Radio Network and subsequently President of the NBC Radio Division.

Labunski has served as a board member of the Radio Advertising Bureau, the National Association of Broadcasters and the International Radio and Television Society. He is on the Board of Advisors of the Bedside Network, a member of the Communication Arts Advisory Council of St. John's University and a member of the Washington Conference for the Advertising Council.

Continued from page 12

INDUSTRY NEWS

Solid-State Circuits Conference Call for Papers Issued by IEEE

The 1970 IEEE International Solid-State Circuits Conference will be February 18-20 in Philadelphia, Pa. Papers not previously published or presented, describing significant contributions in the following fields are invited: integrated electronics, circuit techniques, memories, new device applications, optoelectronics and microwave electronics.

Authors must submit both a 35-word abstract and a 300-500 word summary, to:

L. D. Wechsler
General Electric Company
Electronics Park, Building #3
Syracuse, New York 13201

by October 17, 1969. Overseas papers should reach the secretary by October 10.

Since papers will be selected on the basis of the summaries, they must clearly describe what new and significant results have been obtained, supported by illustrations where appropriate. Authors of accepted papers will be asked to prepare a final version for publication in a Conference Diegst.

The 35-word abstract should be typed on a separate sheet and include the title of the talk, the author's name, affiliation, complete return address and telephone number. Summaries must be submitted in single-side, double-spaced typewritten from suitable for immediate reproduction and screening purposes. The author's name, affiliation, complete return address and telephone contact should appear on the first page and the author's name and paper title on each subsequent page.

A limited number of late news items, suitable for 10-minute papers reflecting important new developments, will be considered if 100-word abstracts and 300-500 word summaries are received by January 23, 1970.

GAB Votes to Become Independent Group

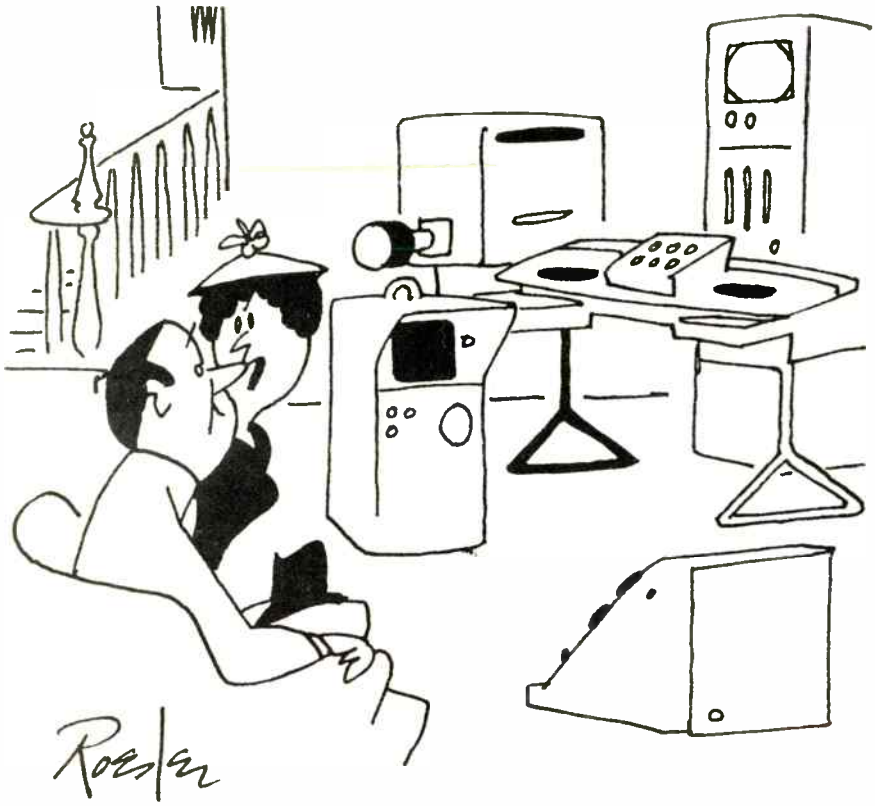
The Georgia Association of Broadcasters has voted to become an independent organization. In making the announcement, President Don Ferguson said it was the opinion of the GAB's board of Directors that the growth of the organization has been such that it could better serve the public interest as a totally independent organization.

The GAB encompasses practically every radio and television station in Georgia and has 200 associate members across the nation. The organization's offices will remain in Atlanta.

Station of the Year

The Georgia Association of Broadcasters has presented its 8th Annual Prestige Awards at the 35th Anniversary Convention of the GAB in Savannah.

WGGA, Gainesville was named Radio Station of the Year, while WAGA-TV, Atlanta was proclaimed Television Station of the Year. WRBL radio of Columbus won the Promotion of the Year Award with its "40th Birthday Celebration."



"FOR PETE'S SAKE, NOW DON'T TALK SHOP ALL EVENING!"

National TV Network Is Planned by Canada Firm

A national television network is being planned and designed for the National Iranian Television Service (NITV) by Hoyles Niblock Associates, Canadian Broadcast Consulting Engineers.

The project began when the Iranian government purchased the country's two existing television stations. The first phase is the establishment of five regional program production centers in Iran's largest cities. These basic facilities will be supplemented by thirty medium and low power stations serving the smaller cities and towns. The station network will be interconnected by a microwave system.

NITV is an agency of the government of Iran.

NOTICE TO READERS:

Be sure to take advantage of the Tech Data Card. Numbers correspond to ads, new products, and Tech Data. Also fill in the information on the right hand corner concerning occupation and type of articles preferred. Notice the data card deadline.

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

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

Training

To advance in electronics, knowledge and ability are required. Grantham offers correspondence and resident instruction, in depth, leading to the degree of Associate in Science in Electronics Engineering. G. I. Bill approved. Credit for previous training and experience allowed. Free Catalog. Write: Dept. E-2, Grantham School of Electronics, 1505 N. Western Ave., Hollywood, California. 90027. 6-67-tf

First phone through tape recorded lessons at home plus one week personal instruction in Washington, DC, Atlanta, Boston, Detroit, New Orleans, Minneapolis, Seattle, Denver, Portland, Los Angeles. Proven results. Our 17th year teaching FCC license courses. Bob Johnson Radio License Preparation, 1060D Duncan, Manhattan Beach, Calif. 90266. Phone 213-379-4461. 1-69-tf

Equipment for Sale

AM or FM Audio P.O.P. form kit $1.50 postpaid. Broadcast Service Co., Box 2605, Corpus Christi, Tex. 78403. 2-69-tf

CoAx TRANSFER SWITCHES—3⅛" Andrews 6720 50 ohm—Unused. $500.00 each. Sierra-Western Elect. Co., Oakland, Cal. 94607. Phone 415-832-3527. 3-69-tf

Surplus audio and video patch panels and patch cords. 500 to 500 ohm repeat coils flat to 20 000 cycles. Send for list. Gulf Electro-Sales, Inc., 6325 Beverly Hill, Houston, Texas 77027. 4-69-12t

For Sale: 30,000 feet #10 soft drawn, non-insulated new copper wire for antenna ground system. $1,000 F.O.B. Mobridge, S.D. KOLY Radio. 8-69-6t

Third Class License instruction booklet, reviews all phases necessary for license, also contains sample test. $1 each. Order from Baker Publishing, 443 So. 13th Street, Lincoln, Nb. 68508. 9-69-3T

FOR SALE: RCA broadcast console, type 76B-1 studio consolette with manual. Two 16 inch Gates transcription turntables with arms and head mounted in Gates cabinets. Reasonably priced. WSRW Hillsboro, Ohio. 9-69-1T

Help Wanted

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