

October, 1973/75 cents

# BROADCAST **ENGINEERING**

*the technical journal of the broadcast-communications industry*



Try  
interrupting  
**WLCC** page 28

Using tower  
strobe lights

Creative  
engineering

Digital logic  
basics

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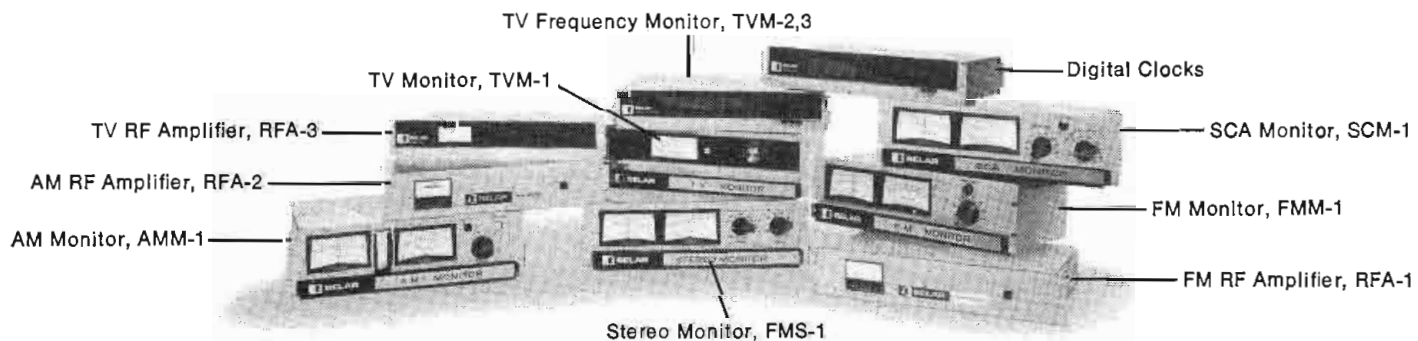
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**editel**  
**minithings ahead**

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# BROADCAST engineering

The technical journal of the broadcast-communications industry

## in this issue...

**24 Creative Engineering In Television.** The authors tell how engineers can become more involved in the creative production process and why this approach is profitable. **William F. Baker and Lawrence R. Baker.**

**24 Call WLCC...They'll Answer.** A college FM station describes its control room operator alerting system. It works with their phone, intercom, and door alarm. **Dave Copeland.**

**32 Public Broadcaster Switches To Strobe Lights.** New Jersey PBA station relates their experience with installing and testing tower strobe lights. **John T. Wilner.**

**36 Basic Digital Logic Review.** The final installment of a four-part series gives some answers to the toughest problem of them all: how to trouble shoot IC and logic circuits. **John Lee.**

**41 "Hands On" Educational FM.** Author describes how a school station comes into being and how school stations need the support of the communications community. **Charles E. Wilson.**

### ABOUT THE COVER

Barbara Stierwalt, a radio student at Lincoln Christian College, can't miss a phone call or have someone interrupt the program. Turn to page 24 and see how WLCC does it. (Photo by Tom Seggelke)

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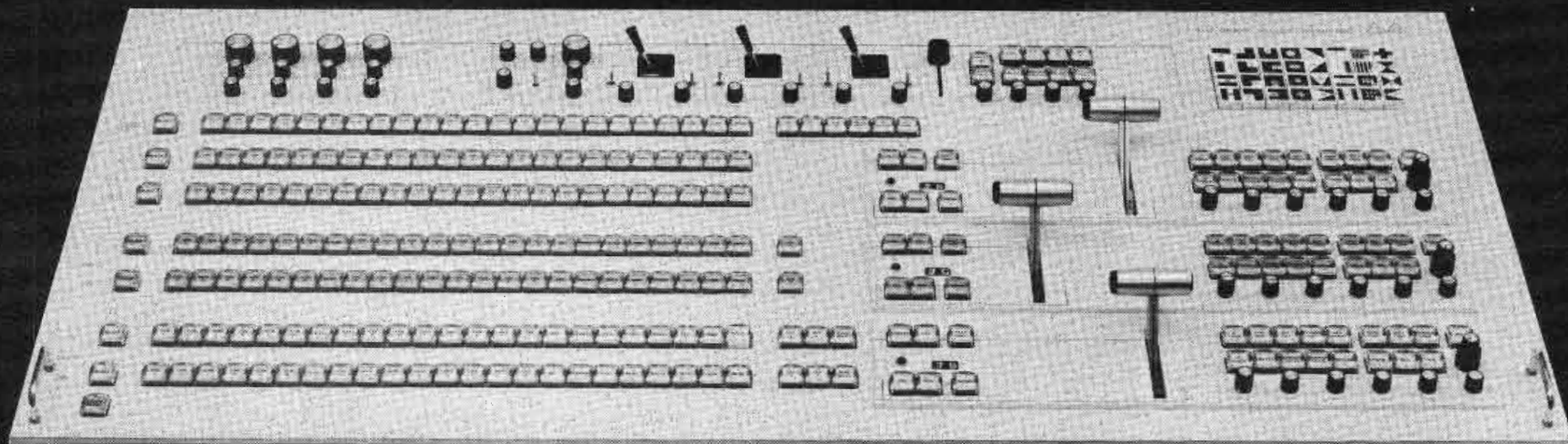
# THE 1600 SERIES

*LINEAR CHROMA KEY, SOFT WIPE, and ELECTRONIC VIGNETTE* are some of the modern concepts in GVG's new 1600 Series television production switching systems. *LINEAR CHROMA KEYING* is a basic improvement in chroma key technique. Its effect is to virtually eliminate noise and tearing, even in the most difficult chroma key situations, such as keying through glass or smoke.

1600 Series systems are a second generation design which is based upon experience gained in the manufacture of almost three hundred 1400 and 3600 Series switchers. This new design is in direct response to customer requests for fundamental improvements in special effects capability, together with a high standard of electrical performance.

Some of the design concepts employed in the 1600 Series systems constitute an advance in the state of the art and, as such, are offered for the first time. These new concepts include both mechanical and electrical aspects of design and have led to the development of systems which are both compact and cost effective.

1600 Series switchers range in size from Model 1600-2A, with 16 input buses - 4 output buses and one mix/effects system, to Model 1600-7G (illustrated below), with 24 input buses - 7 output buses and three mix/effects systems -- each with separate pattern generator, color matte generator, and modulated positioner.



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# DIRECT CURRENT FROM D. C.

October, 1973

by Howard T. Head

## More On Annual AM Equipment Performance Measurements

We goofed in Direct Current for August, 1973, when we reported that FCC performance rules had been amended to require annual performance measurements at each licensed transmitter power output level. What actually happened was that the Commission adopted new rules for those AM stations (about 200 in number) who reduce transmitter output power below nominal levels to control antenna effective field. Those stations which follow this practice must make the performance measurements, but only if the output power reduction is 10 percent or more, and even then only on a one-shot basis when the initial license application is filed.

Annual performance measurements are required to be made only at the highest output power for which the transmitter is licensed. Furthermore, neither the old or new rules govern measurements when operating under the terms of a PSA (Presunrise Service Authorization); requirements for PSA's are spelled out in the FCC instrument of authorization.

## U.S. and Mexico Reach Agreement on FM Channel Assignments

The U.S. and Mexico have finally concluded an agreement for the assignment of FM broadcast channels in the area near the international border. The terms of the agreement include tables of allocations and technical standards applicable within 200 miles of the border.

The technical standards are essentially those now in force in the U.S. Likewise, channel classification (Classes A, C, and D) conform to those employed in this country. The lower 20 channels continue to be reserved for non-commercial educational operation. Provision is also made for FM booster and translator operation within the border area.

## Rules Amended to Make Provisions for Direct Satellite-To-Home Television

The Commission had modified its allocation rules (Part 2) so as to make provision for experimentation and possible future regular operation of direct TV broadcasting from earth-orbiting satellites to the home. The frequency band provided for direct satellite-to-home TV broadcasting is the 11.7-12.2 GHz band, shared with other services.



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From

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Technical problems related to using the band for home broadcasting are plentiful. Primary power at the satellite is limited, and so is the amount of RF power which can be generated. In order to obtain an adequate signal-to-noise ratio, wideband FM is employed, and parabolic receiving antennas (perhaps two feet in diameter) are contemplated, thus requiring that the antenna be accurately pointed and well maintained. And finally, rainfall attenuation in this frequency band is substantial.

The Commission's notice does not foresee any regular broadcasting activity in this band within the next ten years, and even this would require solving some substantial technical problems.

#### Commissioner Urges Improved UHF TV Receiver Performance

FCC Commissioner Robert E. Lee, UHF's well-known champion, has met with the leading television home receiver manufacturers to discuss improvements in receiver performance at UHF. Most of the discussion centered about the UHF receiving antenna problems.

Whereas most home portables include some sort of built-in VHF antenna, many do not include any type of UHF antenna. Ideas which were discussed included providing UHF loop antennas for all receivers, or possibly some sort of combination antenna which would include a VHF/UHF splitter.

Meanwhile, the Commission has turned down a request by the TV receiver industry to eliminate the tuning range of Chs. 70-83 on future designs. Although these channels are no longer assigned in the U.S. to regular TV broadcast stations, there are a substantial number of translators, which are expected to continue operation in this band indefinitely. The Commission noted the substantial expense which translator licensees would incur in shifting to the lower frequencies, and although not noted by the Commission, there is a substantial question as to whether all existing translators can be accommodated below Ch. 70.

#### Short Circuits

The Commission is planning to construct a new laboratory building in the Washington-Baltimore area with a price tag on the order of a half-million dollars...A number of CATV operators have formed a committee to study the use of satellites for CATV distribution... The NAB Board of Directors has appropriated funds to study the deicing of tall towers, but has turned down a proposal to study FM stereo problems in autos...The Commission has amended the TV translator rules on suspension of operation to define "prompt" suspension as three hours, rather than the previous 30 minutes... The Commission has authorized a 10-Watt FM translator east of the Mississippi River in Grand Rapids, Minnesota, which lies directly on the river.



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And state-of-the-art circuitry inside. At an almost-unbelievable price.

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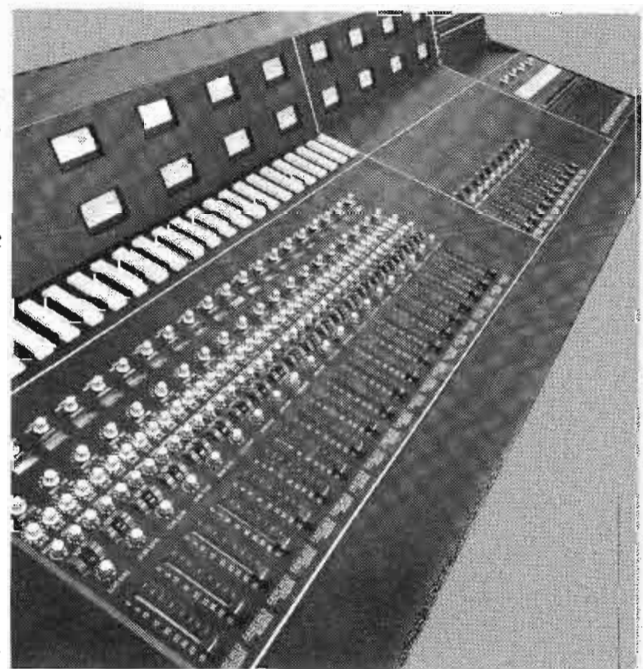
From the moment you sit at the controls, you see. Maximum operator visibility. Functional control groupings. Even the padded armrest\* you'd expect only on a custom console.

But outside's only half the story. Swing up the easy-access hinged control panel,

(If you're familiar with our larger consoles, you'll note we use the same modular boards.)

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# LETTERS TO THE EDITOR

## FM Pilots vs. Audience

*Dear Editor:*

Inasmuch as the FCC suggests that the 19 kHz stereo pilot accompany only stereo broadcasts, engineering at KIOU (FM) has taken steps to include in our automated network joiner, a device that removes the stereo pilot ten seconds after joining network (to allow for completion of faded-down stereo fill music), with resumption of pilot at the completion of the network broadcast.

Only one week after installation it was brought to our attention that quite a few listeners had become unable to hear our newscasts. The problem lies in the construction of, in our case, one particular brand of \$200-variety home stereo receiver. When the listener adjusts this set for normal stereo reception the receiver completely mutes all non-stereo broadcasts. These listeners all thought we had gone off the air.

As a result of these phone calls

KIOU (FM) no longer removes the pilot during such broadcasts. We thought we might bring these circumstances to you, to the attention of your readers, some of whom may have been contemplating similar operations.

These radios **do** exist, and are still being produced. Any stereo FM station in the country has them to contend with whenever the pilot is removed. Of particular concern is the monaural-only station, which is inaudible to many an unaware listener.

We also wish to be brought to the attention of Mr. Kassens and the FCC, bearing these facts in mind, the question of whether cessation of stereo pilot in these circumstances constitutes a discriminatory practice.

**David L. Grimes**  
**Chief Engineer**  
**KIOU Stereo**  
**Corpus Christi, Tex.**

## Keep Those Test Tapes Coming

*Dear Editor:*

Reference is made to Engineer's Exchange, "Phasing For Stereo PB" (July, 1973), by Thomas J. Arledge.

While I am in general agreement with Mr. Arledge with regard to the method (if not the procedure) by which to align multi-track reproduce heads-1/4 inch or other, I must take issue with at least two aspects of his communication.

First, the suggestion that a "test" tape be **made** on a "master machine" indicates at the outset that a standard reproduce alignment tape of professional manufacture and of NAB specifications is not present (why else "make" a test tape?). Therefore, one cannot be sure the "master machine" itself is properly aligned.

Second, certainly it would be most desirable to **discourage** the production of so-called "test" tapes by those who produce syndicated automation music tapes or anyone else, other than those geared to produce a precision product.

We in the broadcast industry have fallen victim often enough to poor reproduction "standards" and even poorer recording techniques due to misinformation and, in many instances, out-right ignorance.

Let us understand for once and for all (for the **good** of all) that the National Association of Broadcasters, with help from many sources, including our brothers in the professional recording industry, has spent vast amounts of money and time arriving at specific conclusions with respect to **all** areas of broadcasting. Those conclusions are now reflected as NAB Standards.

Included in these are standards  
 (More...)

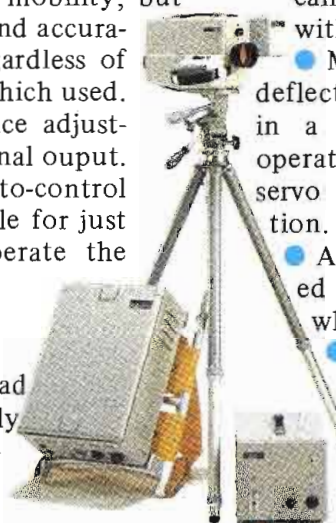
The lightest, most flexible compact color TV camera system for broadcast use yet. A three-tube mini-system, the ASACA ACC-5000 camera and back pack together weigh only 10 kilos (22 lbs). It's a portable designed with emphasis not only on mobility, but also on dependability and accuracy of color output regardless of the conditions under which used. Automatic white balance adjustment. Optimal color signal output. The self-adjust and auto-control systems make it possible for just about anybody to operate the ASACA ACC-5000.

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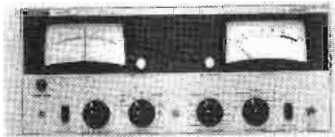


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# FM monitors

## LETTERS TO THE EDITOR

for alignment and equalization. However, it is not just anyone with any tape recorder who can produce a test tape at NAB Standards.

The true test tape is a precision "tool", recorded, by experts, under most exacting conditions, monitored carefully through each step of the recording process on (to quote Ampex) "... highly accurate equipment adjusted to produce flat playback response when reproduced with a theoretically "ideal" playback head and amplifier with correct complementary curve." In other words, equipment the likes of which most broadcasters have never even seen!

One can well imagine the result should each syndication service (and some have been guilty), not mention each broadcast station, arbitrarily set its own "standards" and "made" its own "test" tapes.

The work of the NAB can be beneficial to non-member stations as well as member stations. So

come on, broadcasters, let's get it together! First, let's **get**, and then get **behind** NAB standards. Once this has taken place, any station in the country can record a tape and send it to any other station, assured of full fidelity when it is reproduced. Until then, many, if not most, will continue to flounder in **audible** frustration, wondering why the brand new tapes from the "jungle company" sound muddy, or something equally absurd.

For those who just honestly don't know, standard reproduce alignment tapes of NAB specifications are available. For the usual half-track stereo operations, a 7½ ips. 2-channel test tape (catalog number 4690010-01 for the Ampex version) is the answer. This tape is of NAB equalization and is an original tape - not a dub - and is available for under \$25 from Ampex Corporation, 401 Broadway, Redwood City,

**Your Comments and Ideas Are Welcome At Broadcast Engineering**

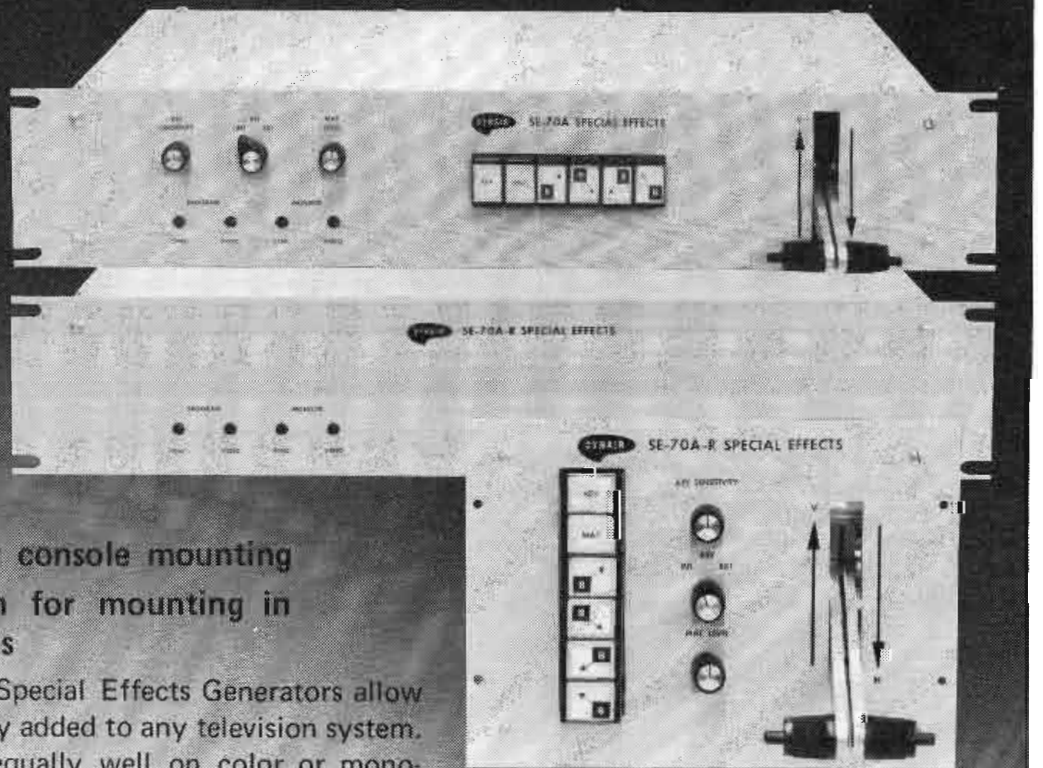
## New Color Special Effects Generators

- Self-contained version for console mounting
- Remote-controlled version for mounting in custom switcher panels

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## How About Those Deceptions!

**Dear Editor:**

Our compliments to you and Mr. Joe Roizen on the article in July **BE** on the subject of color camera basics. We are confident that this will be Part 1 of a long list of equally well written articles.

As the manufacturer of the Plumbicon® camera tube (incidently, the brand name "Plumbicon" is a registered trademark of N. V. Philips and should be so designated in all publications), we would like to make our position clear to your readers relative to a comment made by Mr. Roizen in his article. Mr. Roizen stated in the section entitled "Tube Selection" that there is a tendency for large TV networks to obtain selected or "pick-of-the-litter" camera tubes from the manufacturer and that it's not unlikely that the smaller TV station would get the cast-offs of the networks. Insofar that Amperex Electronic Corporation is concerned, this is absolutely not our practice and all broadcasters are furnished with Plumbicon camera tubes meeting exactly the same high standards. Camera tubes are shipped from our facility with extensively documented test data taken at the time of shipment so that every broadcaster knows immediately the exact quality of the tube which he has received.

The TV broadcast industry is too tight-knit and communicative to allow such deceptive practices (which Mr. Roizen points out) to persist for too long.

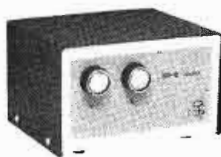
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**For Latest News  
 See  
 Direct Current page 4**

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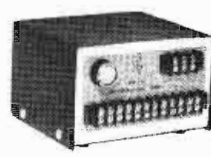
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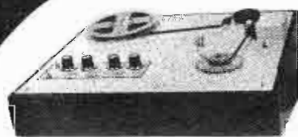
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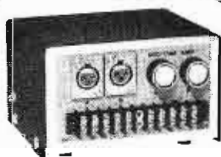
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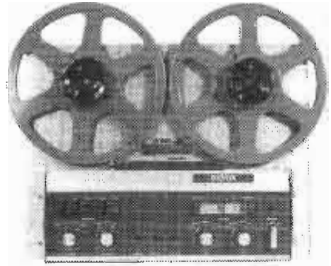
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# NAEB Convention Set For Nov. 11-14

The 1973 annual NAEB convention will be held in New Orleans, November 11 through 14. For registration and general convention information, write: NAEB, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036 or call 202-785-1100.

As we look down the line at the NAEB, we must admit keeping the Association in perspective has not ever been easy. And even within the Association, it has not been an easy task. There have been a great number of changes taking place and there are still others on the horizon.

There are campus limited stations, instructional TV facilities, over-the-air individual TV and state networks, FM and FM stereo stations that vie for listener interest with commercial stations. There are AM's and audio visual departments.

And . . . there is PBS. And who knows what else.

From all these quarters come members looking for ideas and answers to their unique niche in the communications industry. We see teachers who were forced into accepting a program despite their lack of communications training. Yet we also see professionals . . . some of them from the commercial side. From there we can subdivide into a host of titles that only begins with communications director, coordinator, and chief engineer.

Small wonder, then, that the NAEB probably never has served all its membership. It boggles your mind to mentally structure a convention that will meet such diverse needs. We're not sure that recent NAEB reorganizational develop-

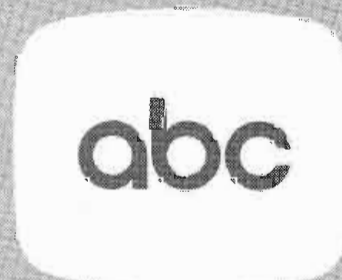
(More...)



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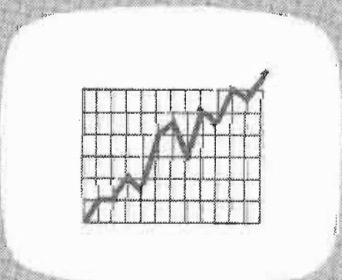
and CBS...



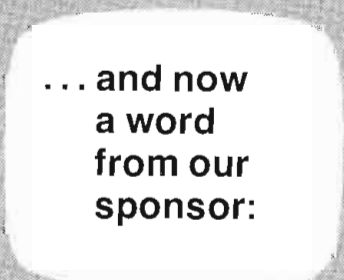
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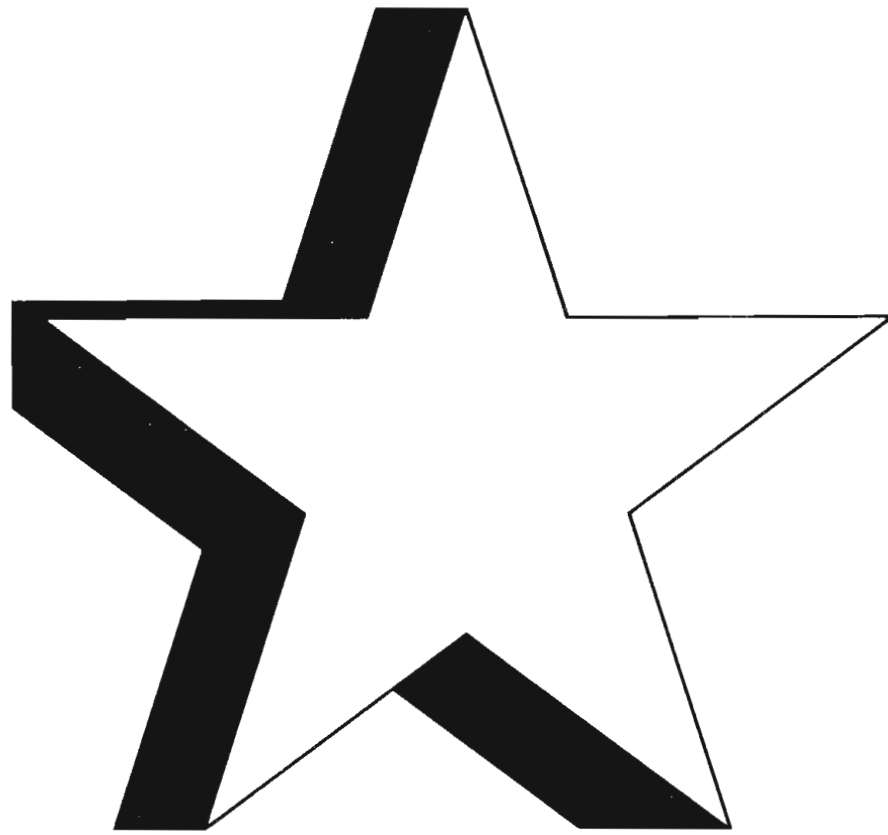
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ments will answer all these needs. But it does look as if there will be some real progress at the upcoming convention. Hopefully, the entire convention will not be bogged down by the annual PBS funding troubles that never get solved. Hopefully, the major emphasis will not be on some PBS-federal controversy that would divert the essential efforts into concentric circles that lock out the real interest and numbers of the remainder of the Association.

At press time, there are 605

educational FM and 228 educational TV stations on the air. We have no current figures for ITFS facilities. But even while these numbers are impressive, for they show progress, the newest and most fascinating growth is in the area of CCTV and audio-visual.

### Staff Structure Reorganization

A major realignment of staff designations and responsibilities has been undertaken by the NAEB, as

part of its transition to a professional society with a membership composed entirely of individuals.

The new arrangement places responsibility for NAEB professional services in the hands of five "program officers," reporting directly to NAEB President William G. Harley. Each officer will have a particular group of specialized duties.

The revised structure eliminates all distinctions previously drawn along institutional or media lines. For example, there will no longer be a "television division," or a "radio division" but rather a set of services available equally across all media.

This arrangement is in keeping with the new, broader focus of NAEB. The association, which previously had devoted much of its time and attention to representation of television and radio stations, is now becoming a national society of professionals in all areas of telecommunications.

The five program officers are William T. Dale, formerly director of instructional services; James A. Fellows, formerly director of professional services; Stephen E. Millard, formerly director of information services; Mary Lynn Moody, formerly convention and conference coordinator; and H. Holt Riddleberger, formerly deputy director of NAEB's television division, Educational Television Stations, which is merging with the Public Broadcasting Service.

In addition, the NAEB staff will include a minority affairs coordinator, Arthur C. Cromwell, and a fiscal officer, William G. Sickles.

### Program Responsibilities

The program officers' basic areas of responsibility are as follows:

Mr. Dale—Instructional and educational development; liaison with educational organizations; operation of a new, expanded library operation—which is to include a microfiche development project—and administration of the Educational Broadcasting Institute program of professional development seminars.

Mr. Fellows—Membership development projects; developing and monitoring of contract and grant activities; operation of membership



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records and mailing system; research and planning of services; internal personnel administration.

Mr. Millard—Staff publications and writing projects, including new professional journal, newsletter, and annual yearbook/directory; promotion and press relations; speeches and other special writing projects; coordination of advertising in publications.

Ms. Moody—Conference and convention planning and operation; coordination of NAEB convention, EBI seminars, and other professional meetings and conferences.

Mr. Riddleberger—Federal regulation and legislation; liaison with cable organizations and licensees; projection of telecommunications development; direction of Program Information Clearinghouse.

### New Ford Grant

The National Association of Educational Broadcasters has been awarded a one-year, \$150,000 grant by the Ford Foundation, for general support of NAEB's development as a professional society of individual members.

Aided by the Ford grant, NAEB is undertaking a new mission and speaking for a new constituency.

The grant is not restricted to specific NAEB programs. Rather, it is intended to support the full range of activities being undertaken by the "new" NAEB. Those activities include programs and services in the three areas of professional development, information and publications, and research and planning.

NAEB President William G. Harley commented: "The Ford Foundation's record of support for the educational and social uses of communications technology is without equal. This grant offers yet another example of the foundation's willingness to support new ventures in communications—for although NAEB is an established organization, it has embarked on a fundamentally new course. Our role as a professional society, and our mission of fostering telecommunications development, will move forward much more rapidly because of this important assistance."

### Sickles Named Fiscal Officer

William G. Sickles, an account-

ant with over 25 years' experience in his field, has joined the NAEB as fiscal officer.

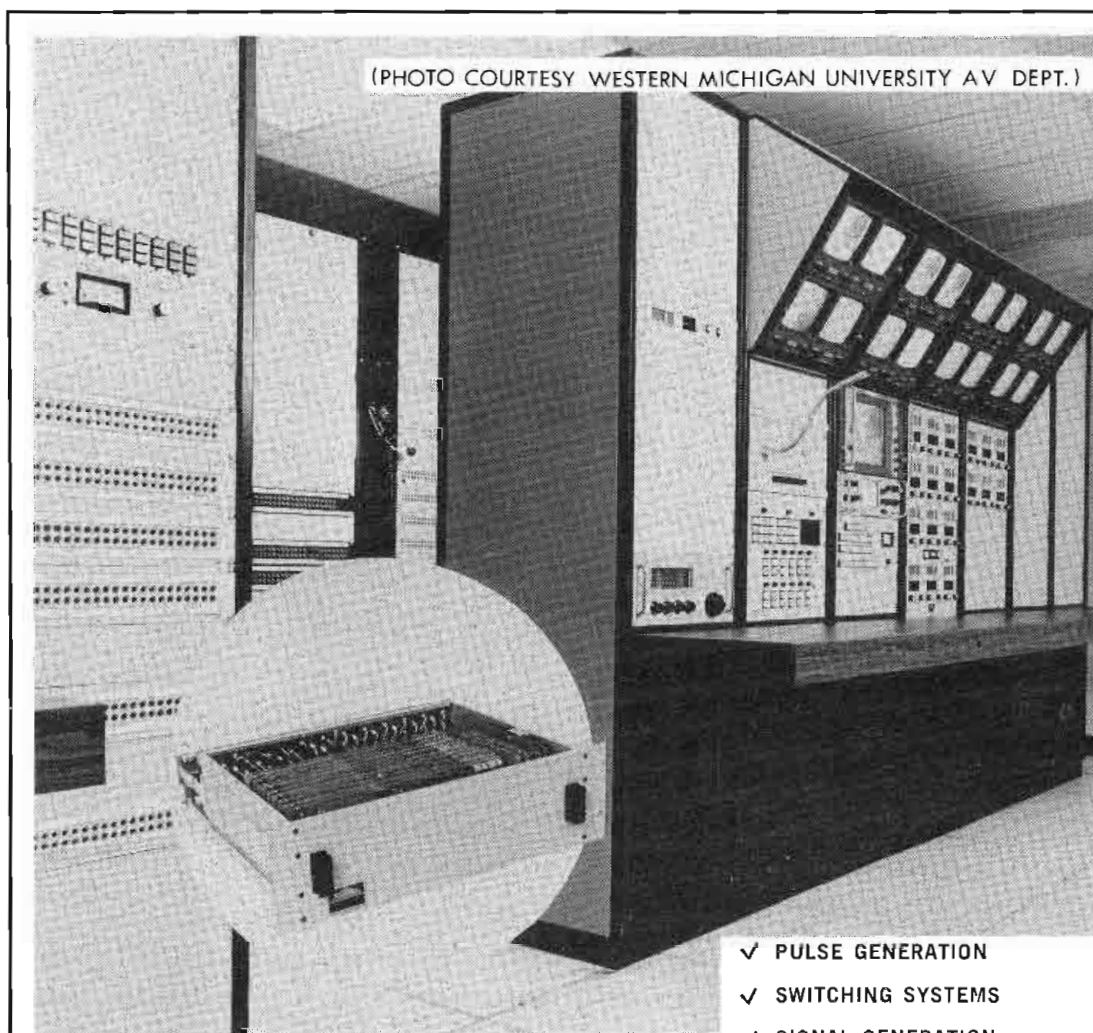
Sickles, 52, has for the past five years been controller with Robert R. Nathan Associates, an international firm of consulting economists. Previously he served in the same position for three years with Rixon Electronics Inc.

A Certified Public Accountant with a Master's degree in Commercial Science from Strayer College of Accountancy, Mr. Sickles spent most of his career in private practice, as a senior partner with two public accounting firms in the District of Columbia.

## SMPTE, Oct. 14-19

Walter A. Fallon, President and Chief Executive Officer of Eastman Kodak Co., will be the Guest Speaker at the 114th SMPTE Technical Conference, it was announced by SMPTE President Byron S. Roudabush.

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## Wolfe Seeks Suggestions On Certification Plan

Research by members of the SBE committee on Certification of Broadcast Engineers is continuing, according to committee chairman Ben Wolfe, vice president, engineering, WTOP-TV Broadcast House, Washington, D.C.

The committee, consisting also of Al Chismark, director of broadcast engineering, Meridith Corporation, Syracuse, N.Y.; John T. Wilner, director of engineering, State of New Jersey Public Broadcast Authority; Leo Reetz, allocations and RF Systems, American Broadcasting Company, New York; and Eugene Hill, vice president, engineering, Kaiser Broadcasting, Oakland, Calif., were appointed at a July 18th special session of the SBE Board of Directors in Washington, D.C., which had been called especially to discuss certification.

The board then authorized Wolfe as chairman of the committee to proceed with the next phase which is to be development of plans for administration, examination procedures, and waiver standards, or grandfathering. **Before the board meets again in early November to consider the committee's finalized plans for implementation of the certification program, Wolfe would**

**like to hear suggestions, recommendations, and comments from as many members and chapters as possible. He may be contacted at WTOP-Broadcast House, 40th and Brandywine St., N.W., Washington, D.C. 20016.**

### Reregulation

The SBE Reregulation Committee, consisting of committee chairman John Wilner, and James Wulliman and Edwin T. Karl, all of whom are also members of the SBE board of directors, has requested that any SBE member, or chapter, having recommendations relating to FCC reregulation may submit these to a subcommittee chairman for coordination and forwarding to the FCC. The subcommittee chairmen's addresses are:

### Television Engineering

John Wilner, Dir. of Engineering,  
State of N.J.  
Public Broadcast Authority  
1573 Parkside Avenue  
Trenton, N.J. 08638.

### FM Engineering

Edwin T. Karl, V.P., Engineering  
Suburban Broadcasting Corp.,  
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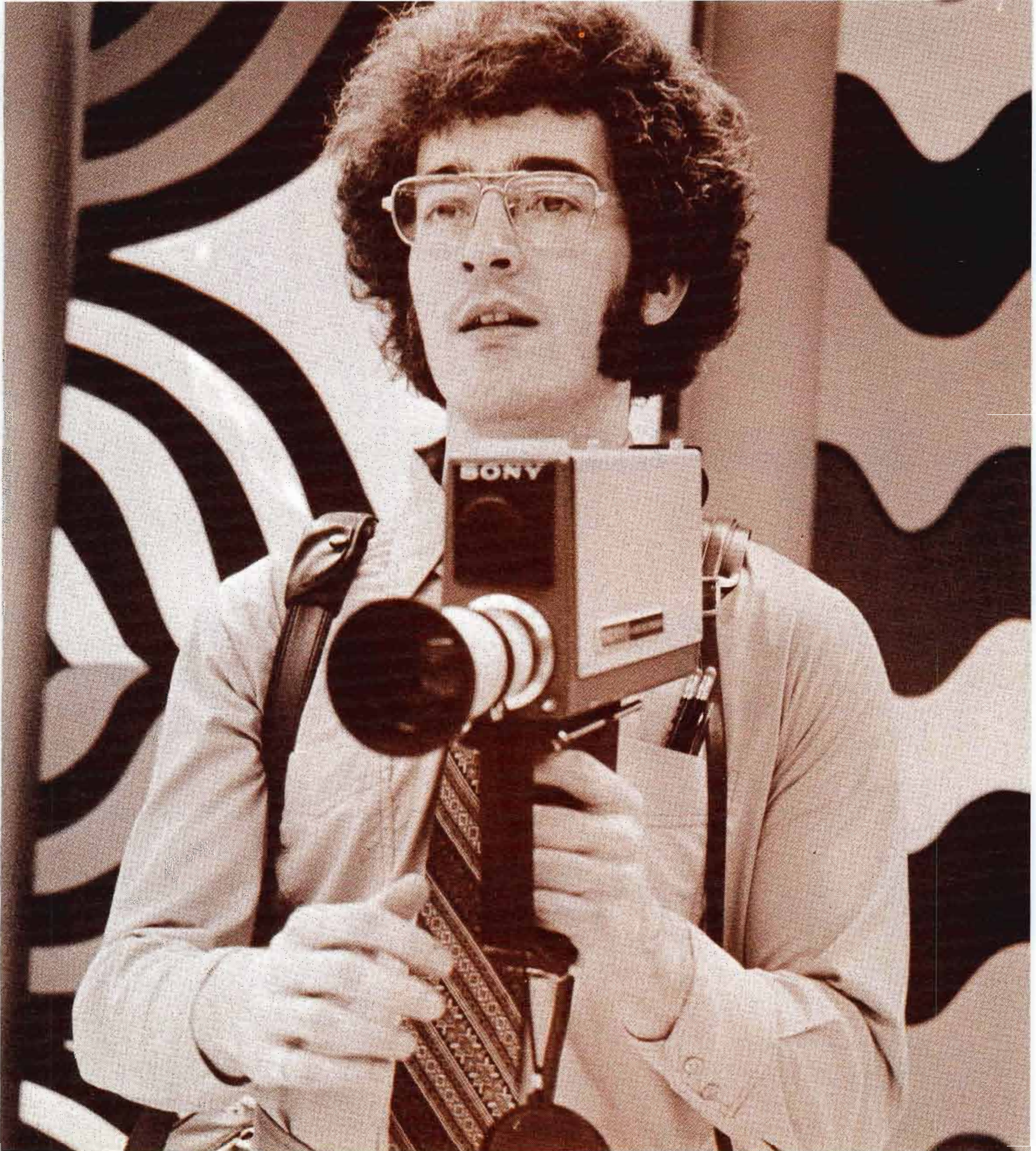
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# CABLE engineering

*in this issue....*

Industry News .....CE-3

Cable Construction .....CE-4



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## Copyright Payments Must Be Reasonable

# INDUSTRY NEWS

George J. Barco, general counsel to the Pennsylvania Cable Television Association, told a Senate subcommittee recently that the CATV industry will be seriously damaged if copyright payments "the industry simply cannot afford to pay" are imposed.

In testimony before the Senate Subcommittee on Patents, Trademarks and Copyrights, Barco outlined the position of the Pennsylvania association. "Its underlying principle is simply that television signals received 'off-the-air' should not be subject to the payment of copyright fees so long as similar payments do not apply to reception by conventional antennas. The 'Position' recognizes that copyright fees should be payable for copyrighted programs received by microwaving or similar long distance transportation, and that such microwaving should be subject to regulation in view of its impact on television broadcasting, copyright property rights, and the interrelated market patterns of both."

After outlining some differences in philosophy regarding regulation and copyright payments both within NCTA and the CATV industry, Barco stated that "every possible effort was made by the NCTA copyright committee" and others in the industry to reach accord with the copyright owners on the issue of copyright fees. "I can state from my own personal knowledge that the attitude, demands and conduct of those representing the movie copyright owners during the sessions which I attended were such that all efforts to deal with them were vigorous exercises in futility," Barco testified.

Barco, putting aside "completely my firm conviction that copyright payment for the reception of television signals received 'off-the-air' is wrong in principle and discriminatory in effect," capsulized the diffi-

culties of CATV operations today. Spiraling costs in these inflationary times, increased pole attachment fees, stricter FCC technical standards, compulsory cablecasting, all contribute to a much higher cost of doing business. This is a cost, Barco said, that must be borne mainly by the cable system operator. "There is a definite and absolute limit in the possibilities for service charge increases, either because approval cannot be secured from the municipality...or because the market conditions will not support the increases, or for both reasons." In addition, new systems, particularly in large metropolitan areas, are under even greater cost burdens, Barco said.

He urged the committee to consider the subscribers to CATV and the CATV industry itself, both from a public interest point of view. "I respectfully submit that a proper concern for the interests of the subscriber as a consumer demand that no copyright payment should be imposed which cannot be absorbed by the industry, without passing the copyright charges to the subscriber. Further, I respectfully submit that a proper concern for the future growth and development of cable television and the services it can provide to the public demands that any copyright payment should be such that payment does not restrain, impede or burden the industry's growth and development."

Barco outlined several points he would like to see included in the final copyright bill, including a compulsory license extending to all "off-the-air" signals; a maximum of one to two percent copyright fee for such reception service, fixed statutorily; an initial three-year period of a one-tenth of one percent fee per channel for microwave imported signals, then negotiation of the fees; no exemption for the

systems based on system size, type of ownership or kind of system; and an exemption or credit incentive to promote cablecasting and local origination of programming.

Barco concluded: "To fulfill the many promises of cable, we of the cable industry are willing to make a fair and reasonable accommodation on copyright for even off-the-air reception!"

## Special Sports Treatment?

NCTA Chairman Amos B. Hostetter has taken issue with the "special treatment" of sports programming in the proposed copyright revision bill before the Senate Subcommittee on Patents, Trademarks and Copyrights.

Commenting before the committee on the cable sports blackout provision of S. 1361, the so-called Omnibus Copyright Bill, Hostetter emphasized the unique treatment sports is afforded under the proposed bill:

"With the exception of the sports blackout provision, the liability of various secondary transmissions depends solely upon such factors as the classification of the primary broadcast station, the location of the cable system, the types of broadcast signals available in the market, the existence of exclusivity agreements, and the certain notices and payments required by cable systems. What makes the sports blackout provision unique is that it is the **only** provision in Section 111 (of S. 1361) which makes a distinction based upon the program content of the secondary transmission."

In addition, Hostetter said, all other types of programming are treated the same in determining if secondary transmission will be subject to a compulsory license. "Only

*(Continued on page CE-8)*

## Part 2

# Line construction techniques

By Kenneth Wayne

There are many different types of TV transmission cables, and as many ways to put it into service. This article will confine itself to coaxial cable that is unjacketed aluminum sheathed foam dielectric with copper center conductor.

The standard outside diameter of the cable is .412 of an inch, .500 of an inch, and .750 of an inch. The latter two are usually called half and three quarter, with the larger being used exclusively for trunk because it has the lowest attenuation. The half is used for both trunk and feeder distribution, and the .412 is used most exclusively for feeder cable.

The coaxial cable is wound on disposable wooden reels with a protective material covering the outermost wrap. Do not remove the protection until the last possible moment before use. Preferably, not until the reel is loaded onto the trailer or reel jack. Rolling a fully loaded reel over a small rock can dent the fragile aluminum coax several layers deep into the reel and can cause a multitude of problems...the end result being visible at the subscriber's set.

The cable should be loaded onto the trailer with the tag end coming off the top of the reel. The reel should be inspected thoroughly for any projections on the inner surface so as not to damage the cable as it unwinds from the spool.

The drive-off method of cable placement is by far the fastest and easiest of the methods to install lashed messenger supported coaxial cable. It is the most economical but it is also the most crucial. Although there are numerous types of equipment available for installing cable by this method, it can be done with the simplest of tools if the project is done carefully and the spinning or lashing machine is in good shape.

### **Cable Drive-Off**

To begin the drive-off procedure, position the trailer behind the pulling vehicle as near as possible

below and parallel to the support messenger. Pull the tag end of the cable up to the pole and temporarily secure it by wrapping the end around the strand support hardware. Place a cable guide on the messenger (cable shoe or cable roller block will do just as well), and let the cable rest gently in the furrow. A cable block pusher, commonly called a shotgun, can now be placed on the messenger and the cable guide can be pushed towards the next pole. Without the use of a shotgun, it is necessary to attach a pulling rope to the guide so as to position the cable feed straight into the lashing machine.

The reel trailer should be equipped with a tensioning device, if possible, to keep the cable semitaut. This will keep wobbles out of the cable and give it a neat appearance as it is lashed to the messenger. Be extremely careful not to get the cable too tight, though, as it may flatten on the bottom as it slides over the leading guide or roller.

The next step is to position the lashing machine on the messenger and to place the cable into and through the guides and rollers of the machine. The lasher should then be positioned a foot or so past the point (towards the next pole) where the lashing wire clamp is to be placed.

### **Lashing**

Now let us assume we are lashing from right to left. The lashing wire clamp is secured on the top of the messenger with the tightening nut on the back side. (When facing the pole on the hardware side, the lashing wire clamp on the right is tightened on the back side. The clamp on the left is tightened from the front.) This places the clamp in the proper position to secure the lashing wire and maintain clearance from the coaxial cable for the prevention of damage to the cable.

At this point, the tag end of the lashing wire is pulled from the coil

in the lashing machine and two wraps are taken around the final roller. This, of course, will make the lasher harder to pull, but it is going to be pulled by a vehicle anyway. By making the wire pull from the lasher a little harder, it will put more strain on the lashed cable, and will lash the cable tighter to the messenger. The wire is then wrapped once around the cable and messenger together and twice around the messenger only, all in a clockwise direction. Bring the wire between the shoulder and the washers of the clamp and then around the stud several times to finally secure the tag end. The nut can then be tightened and the lasher is ready to pull.

A cable support strap and a spacer are placed on the cable to prevent the lashing wire clamp from rubbing against the cable. This is positioned about two inches from the lashing wire clamp towards the strand support hardware, which can be tightened at this time. **The strap should be snug, but it is not necessary to bear down with too much exuberance as the spacer can ding the cable. This can cause a weak point in the cable and if it is ever necessary to relocate equipment at a later date, it can cause a kink when forming a new expansion loop.**

Everything on the pole is now ready to go. The pull rope from the lasher is secured to the vehicle or to the trailer whichever is the most handy, along with the pull rope from the cable guide, if a shotgun is not being used. The driver may now proceed towards the next pole. The cable will pay off the reel and the lasher will spin the messenger and cable together very neatly and very tight.

### **The Second Pole**

The vehicle should proceed at a steady pace until the lashing apparatus reaches the next pole in line. Stop the equipment a foot or so from the strand support hardware

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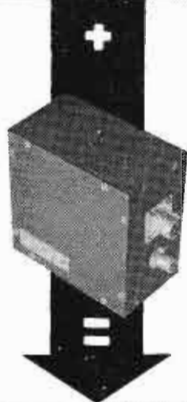
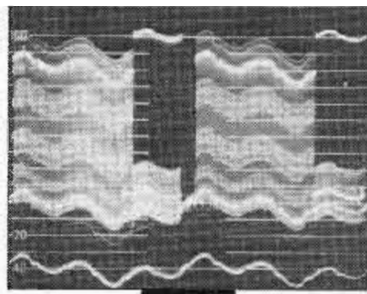


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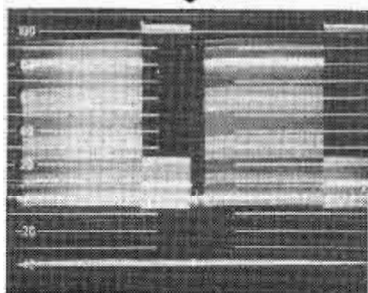
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CE-6

or any other obstructions, such as guard arms, strand splices, cross-over clamps, etc. Tension on the lasher pull rope should be maintained until the lashing wire is secured. If slack is let into the spun lashing wire, you have defeated the purpose of the second wrap on the final roller of the lashing machine. There are tools available for temporarily securing the lashing wire to the strand until it can be permanently secured with a lashing wire clamp.

After the lashing wire is secured, the equipment can be transferred to the other side of the pole and made ready to lash again. When everything is ready to proceed once more, slack is pulled into the cable below the strand support hardware for future drip and expansion loops. The slack is held until a sufficient amount of cable is lashed down the line to prevent the slack from slipping. You can proceed in this manner until all the cable is removed from the reel or the dead end is reached.

The drive-off method is again the easiest way for cable installation. With practice and foresight, a very large amount of cable can be placed in the air. Lashing wire clamps, straps, and spacers, must be placed on each side of the pole. The strand support hardware should be tightened and a small amount of slack must be pulled for expansion loops that are necessary for the electronics when they are spliced in.

### Stationary Reel Alternatives

The stationary reel type of installation involves a great deal more labor and equipment and is far more time consuming. It is the method used most often because pole lines are usually located off the road and in inaccessible areas not suited for drive-off means.

Basically, there are two alternatives for the stationary reel method. The first is to pre-set cable roller blocks while back stringing a pull line with placement of the cable in a secondary operation. The second is to pull the cable and set the blocks in one operation. This is the method that will be explained as the former is similar to stringing strand with a take-up reel utilizing airplane cable. The lashing oper-

ation is the same regardless of how the cable is laid in.

**It might be stressed at this point that an excessive amount of handling of the cable should be avoided. Aluminum cable is very fragile and will bend quite easily. Unnecessary and improper handling is the reason a considerable amount of aerial plant looks like discarded tire chains hanging in the air.**

Ideally, the cable is loaded on to a trailer equipped with a tensioning device and brake. It should be loaded with the cable coming off the top of the reel. The trailer is positioned in a manner to give the cable straight access to the first cable suspension roller block placed on the messenger.

It is necessary to place a cable pulling grip equipped with a snap and swivel on the tag end of the cable. (The swivel helps remove the twists that are inherent on the reel of the cable during the unwinding of the spool as it is emptied.) This, in turn, is snapped to a ring snap and a rope which is pulled up the pole and snapped to the messenger. The first block is secured and the cable laid in the roller. The cable is now ready to pull towards the next pole.

As the cable is pulled out, blocks are positioned on the strand to keep the cable in the air and to prevent it from being damaged or abused. (The blocks have brakes on them to prevent them from moving in the direction that the cable is being pulled. Therefore, the cable should always be lashed back towards the direction from whence it came.) The positioning of the blocks depends on the span length. As the weight of the cable is brought to rest on the blocks, it will form a slight bend. The closer the blocks are, the lesser the bend. A block is always placed at every pole and approximately at forty-foot intervals. Where the strand cannot be reached with a ladder truck to place the blocks, it is necessary to use a block setting head attached to a lay-up stick to set the blocks.

When the dead end is reached or the cable has run out, the lasher is brought up the pole and positioned on the messenger. The lashing wire is secured and a running block is placed in front of the lashing machine. I recommend putting two

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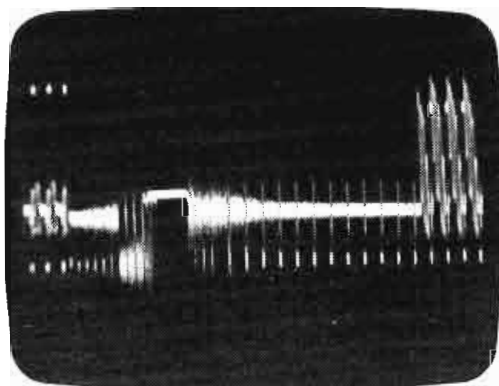
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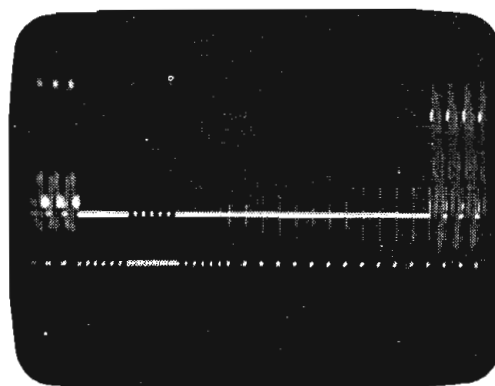
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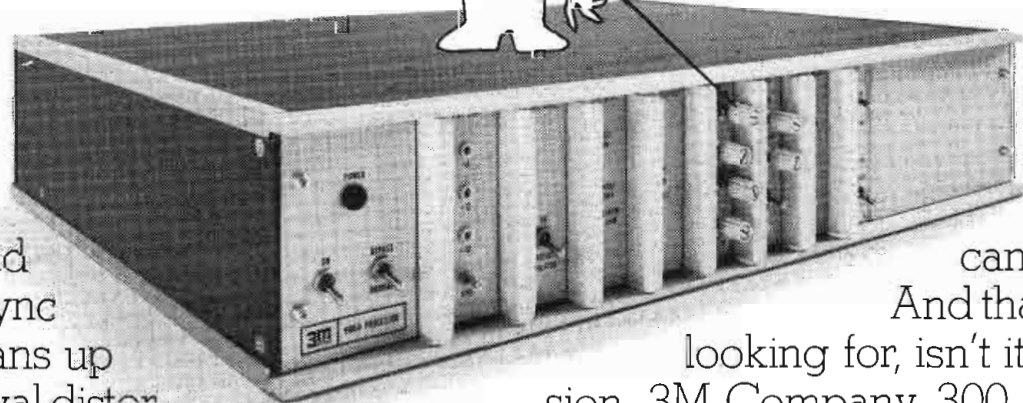
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wraps on the final roller, if the groundman is able to pull the lasher because of the reasons mentioned earlier.

### **Pulling The Lasher**

There is an art to pulling the lasher, as simple as it may seem. Too much lead will make the machine skip. Not enough lead and the lasher cannot be pulled. The lead has to be changed from pole to mid-span and then again when nearing the pole. The lasher should not be jerked and tension should be kept on the rope until the lashing wire is secured. The lashing wire clamps, straps, and spacers are made up and slack is pulled into the cable for electronic equipment and loops. The lasher is now pulled to the next pole and the cable blocks will slide along the strand in front of the lasher where they can be removed by the lineman at the next pole. The lasher is changed over to the other side with the process continuing until the cable is all lashed to the support messenger.

In summary, if tension is allowed

to remain on the cable, blocks are positioned correctly, and the coax is not handled excessively, it should lash to the messenger with both the coax and strand appearing to be one cable. Three to five thousand feet can easily be installed daily with a three-man crew utilizing these methods.

A little ingenuity and practice perhaps you can refine these procedures for your use. If it looks good in the air when it is installed, it will undoubtedly serve the subscriber with good quality signals for many years. □



"THE WEATHERMAN REVISED HIS FORECAST AFTER YOU LEFT."

## **Sports**

(Continued from page CE-3)

sports programming receives special treatment."

While reiterating cable industry support for the concept of "compulsory licensing for secondary transmissions with the payment of reasonable fees for such licenses," Hostetter termed it "unreasonable and disserving of the public interest for the Congress to treat sports programming differently in Section 111 from other programming, and to deny cable systems compulsory licenses for carriage of such programming where they would otherwise exist."

After discussing the sports blackout provisions in S. 1361 and their relation to the antitrust exemption granted to professional sports teams regarding television coverage, Hostetter concluded:

"We submit that the problems of defining the area of protection, which may differ from sport to sport, market to market, and year to year, as well as the ability to grant waivers for equitable reasons, demand a flexible approach to regulation which cannot adequately be met by the necessary rigidity of copyright legislation."

Hostetter suggested that the FCC would be the more appropriate regulator in the sports programming area, given a Congressional mandate to do so. However, if Congress deems necessary "preferential treatment" for sports programming, Hostetter suggested the following alternative language be inserted in the bill in place of the present provisions:

"A cable system, located within the urbanized area of a city in which a professional baseball, basketball, football, or hockey team is permanently headquartered, which carries secondary transmissions of distant stations pursuant to a compulsory license as provided for herein, may be required to delete programs on such signals embodying home games of such team, if the home team or its league has made the game unavailable to all television stations which serve the city in which the cable system is located. Cable systems in existence on the date of enactment of this ACT shall not be required to delete such programs."



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#### **Chapter 1 - Binghamton, N.Y.**

**Chairman: Larry Taylor,  
WENY AM FM  
Mark Twain Hotel,  
Elmira, N.Y. 14902**

The Treadway Inn, Owego, was the location of the Regional Miniconvention sponsored by Chapter 1, Chapter 2 of Northeastern Pennsylvania, and Chapter 2 of Central New York; the miniconvention, to be held October 19th, included noon to midnight equipment exhibits and free food and refreshment. More information on this event, which may be repeated annually, according to co-chairmen Larry Taylor, WENY AM FM, and Charles Morgan, WARM, will be provided in the next issue.

#### **Chapter 11 - Boston, Mass.**

**Chairman: Ross Kauffman,  
Asst. CE  
WVCB-TV, 5 TV Place,  
Needham, Mass. 02192**

Stephen Cohn, Secretary-Treasurer of the chapter, has advised the SBE national office that another rapid-growth phase for the Boston chapter is anticipated. Cohn was recently elected along with Ross Kauffman of WVCB-TV as Chairman and Mike Goldberg of WGBH-TV as Vice-Chairman.

#### **Chapter 16 - Seattle, Wash.**

**Chairman: John Maxson,  
KETO FM  
17425 63rd Pl., S.E.,  
Issaquah, Wash. 98027**

At the August meeting, nominations for the chapter Board of Directors were announced as: Jack Shawcroft, KING-TV; Gene Newcomer, Pacific Northwest Bell Telephone; James Hatfield, Consulting Engineer, STI; Robert Dietsch, Field Office, F.C.C., Seattle; and Nick Foster, editor of the chapter NEWSLETTER. Sadly, however, it was also announced that the nominations which were made at the July meeting would have to be modified due to the passing of Jim Hatfield. Jim had provided many interesting talks at past chapter

meetings, and had prepared the Broadcast News section of the NEWSLETTER each month.

The September meeting was a talk by Chuck Anderson of Ampex Research and Development Engineering including a review of video recording standards.

#### **Chapter 26 - Chicago, Ill.**

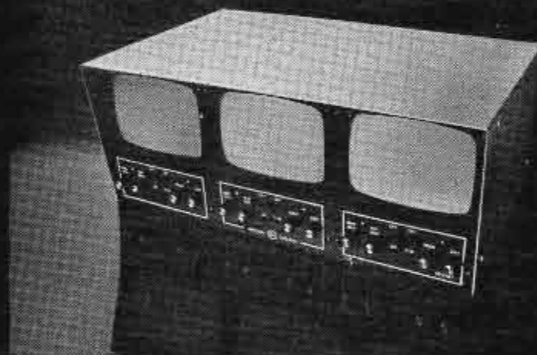
**Chairman: Bradley Anderson,  
Univ. of Ill., P.O. Box 6998,  
Chicago, Ill. 60680**

At the most recently reported

meeting, July 12th, Edward Dervision of Motorola, presented a discussion and demonstration on Microwaves, and Microwave Lines and Antennas. Dervision covered open 2-wire transmission lines, shorted and open stubs, antenna matching, horn type antennas, and attenuation materials. Chapter officers express special appreciation to NABET Local 41, a sustaining member of Chapter 26, for support and for urging their members to attend.

(More . . .)

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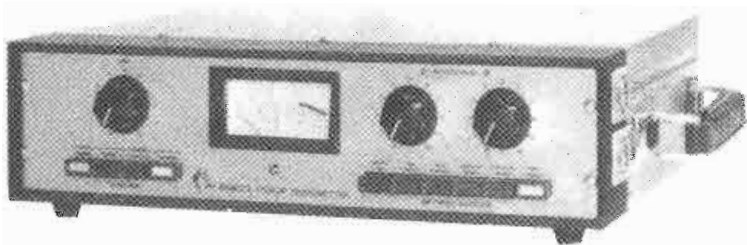
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**Changes Proposed by SBE**  
**FM Subcommittee on Reregulation**

	RULE CHANGE	ARGUMENT
73.256 (b)	Change to: "Both transmitters are type accepted for operation at the licensed power output".	Allows the station more latitude in the selection of transmitting equipment as long as the equipment is the type accepted to operate at the required output; as well as meets the annual proof of performance requirement.
73.262 (b) (3)	Delete in its' entirety.	Precludes development of equipment and advancement of the state of the art, i.e., operation 24 hrs. per day to test a new type of exciter,quad broadcast, or even a different limiting system such as a Dolly process is not allowed under the present rules.
73.268	Delete: "85% lower limit" Add: "Generally the dynamic range shall conform to the type of programming to be transmitted."	It merely clears up the language and very ambiguous interpretation by radio inspectors.
73.275 (a) (2)	Add: "within an hour"	Allows FM Rules to conform with the identical death of remote control provision include for television.
73.282 (d) (2)	Program Log - Add: "in the cast of automated logs, both audio and printed data, the logging equipment shall be continuously validated by an off-the-air signal from an appropriate receiver, and may serve in lieu of an operators' signature. The validation system shall be tested daily and such test shall be entered and signed by the person conducting the test.	Relieves the operator on duty of the burden of having first hand knowledge of what was actually transmitted.
73.283 (a) (6)  (7)	Add: "and modulation level measurement" Add: "SCA injection and center frequency deviation measurement daily".	For the purpose of insuring that the injection levels are both checked; as well as clarifying the language of the Rules.

	<b>RULE CHANGE</b>	<b>ARGUMENT</b>
73.283 (b) (4)	Add: "or visual alarm".	Bring the Rules up to the state of the art.
(5)	"..unless the alarm circuit monitors or scans continuously".	
73.284 (a) (1)	Delete: "each week"	Clarifies language.
(b)	"the statement shall also include the amount of time exclusive of travel time to and from the transmitter which was devoted to such maintenance duties"	Clarifies language.
73.284 (b)	Add: "the statement shall include the time inspection commenced".	Clarifies language.
73.295 (f) (5)	Add: "..and injection".	To be consistent.
73.331 (b) (1)	Change tolerance of frequency monitors should be changed to 200HZ.	It is inconceivable allowing a piece of test equipment with a capability of one-half of the operating tolerance to be checked. In this way, the measurement is at the very least to the power of 10.
73.332 (i) (4)	Change tolerance of percentage of modulation read 2% of full scale.	Once again, reinforces the tolerance of the measuring equipment to be more state of the art.



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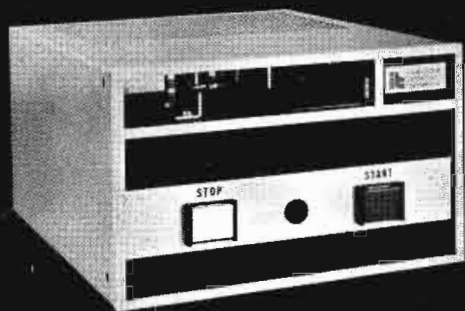


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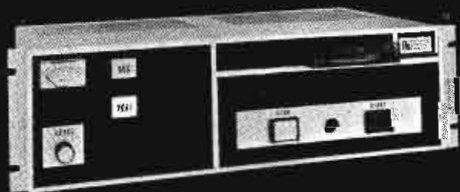
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**Chapter 21 - Spokane, Wash.**  
**Chairman: T. O. Jorgenson,**  
**KXLY TV,**  
**West 500 Boone Avenue,**  
**Spokane, Wash. 99201**

The Spokane chapter continues to meet every Monday at noon at the Castle Restaurant, in the Lincoln Heights Section of Spokane. Chairman Jorgenson reports that those attending often include traveling engineers and broadcast manufacturer sales representatives, who are always welcome. Topics discussed at each meeting vary; one recent session included a discussion on Grounding and Lightning Protection which was initiated by Ron Valley, chief engineer of Educational Channel 7, KSPS TV.

**Chapter 32 - Tucson, Ariz.**  
**Chairman: H. J. Paine,**  
**CE, M.D. Labs,**  
**Univ. of Ariz. Medical Center,**  
**Tucson, Ariz. 85124**

This newest chapter of the SBE met on June 21st at KZAZ-TV,

Channel 11 studios. Election of officers took place with H. J. Bart Paine, who had been chairman pro tem, becoming the official chapter chairman; Richard A. Heatley, chief engineer, KZAZ-TV, was selected as vice chairman; and Charles M. Glickman, electrical engineer, University of Arizona, was voted as Secretary-Treasurer. Election committee included Armand Sperduti, committee chairman. The technical part of the meeting included a demonstration of the new Fernseh remote cameras at Channel 11, KZAZ-TV, as are used for the nightly remote pickups of the Tucson Torsos baseball games.

**Personal Notes**

Henry Van Amburgh, former chief for Guy Gannett Broadcasting Services, WGAN Stations, Portland, Maine, reluctantly submitted his resignation on the SBE board; Henry has decided to leave broadcasting in favor of the hardware business.

Lew Wetzel, who, at various times, was Assistant Director of Engineering for Triangle Broadcast Division, President of the Society of Broadcast Engineers, and antenna design engineer for Shively Labs, is now associated with Dielectric Products, Inc., a manufacturer of strobe lighting systems for towers, in Raymond, Maine.

Leonard Lavendol, chief engineer of WTEN-TV and WCDC-TV, Albany, N.Y., retired recently. He was noted for having donated many hours of personal time to the Annual Cerebral Palsy Telethon.

Reports on SBE chapter meetings and on announcements of future events will be published in these pages monthly. It is important that chapters send information on meetings and other news as promptly as possible. Include photographs whenever available; preferred photo size is 8 x 10, but smaller sizes are also usable.

The monthly deadline for submitting copy to the SBE editor is the 25th of the 2nd month preceding the month of publication; for example, the date by which copy must be received by the SBE editor for the December, 1973 issue is October 25th; for the January 1974 issue, the deadline is November 25th, and so on.



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**CONSOLES**

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## NAB Opposes Annual Fees

The National Association of Broadcasters is urging the Supreme Court to invalidate as arbitrary and unlawful higher annual fees imposed on broadcasters by the Federal Communications Commission.

NAB said in a friend-of-the-court brief that the Commission "clearly exceeded its authority" in adopting a new fee schedule designed to recoup the full amount of its annual spending.

It said independent agencies like the FCC, by Congressional edict and executive directive, can only impose fees "where there is an identifiable recipient who has received a measurable amount of government service from which he has obtained a special benefit." Where the identity of the ultimate beneficiary is obscure, it said, the directive specifies the service performed is considered of benefit to the general public and no charge should be imposed.

NAB's brief argued that the Fifth Circuit Court of Appeals erred in giving a broad interpretation of the "value to the recipient" criterion in upholding the FCC's new fee schedule. It noted that the Court of Appeals for the District of Columbia, in a similar case involving higher fees of the Federal Power Commission, adopted a narrower view and properly held that "monies for the administration of programs benefitting the general public should come from the general fund of the treasury."

NAB's Supreme Court brief said the Commission's action was a "wrongful attempt to recoup the costs of Commission activities which are of benefit to the public generally and do not constitute special services inuring to the benefit of identifiable recipients."

"NAB respectfully requests this court," its Supreme Court brief said, "to correct and reverse the errors of the Fifth Circuit and the misapprehensions of the law practiced by the Federal Communications Commission and invalidate the annual fees charged commercial broadcast licensees."

# Cooke

# DYNA-MITES

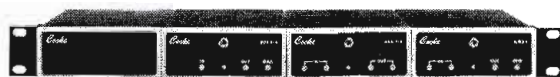
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Equivalent to all broadcast type PDA's, 1 in, 4 out, regenerative.
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**Fig. 1** William Baker in Videotape Control counseling with videotape engineer Larry VanCamp at right.

## *Creative engineering in television*

By William F. Baker and  
Lawrence R. Baker\*

In the past, people entering the broadcast engineering profession may have considered it a stepping stone to "more creative" production areas. It really shouldn't have been like that. With today's highly sophisticated equipment and with new production tools (such as cartridge videotape), the engineer and technician are gaining a greater opportunity to be the key creative element in the broadcast production team.

Cameramen have always had a chance to be creative with shots—the director willing. But today, when given a chance, videomen can participate in creative production by creating new effects in commercials and on-air productions. Videotape operators are coming into their own as creative editors when given the chance and are often editing news pieces better than their film counterparts. More will come if there is an understanding of the creative potential of the engineer by management, production and sales.

\*William Baker is Executive Producer for WEWS-TV, Cleveland and has a Ph.D. in communications. Lawrence Baker is a video tape engineer for NBC's Cleveland station, WKYC-TV. He has won several awards for engineering of programs.

The writers have found the engineer can be one of the most important creative elements in television production, when given the right opportunity. But there have been many traditional situations for conflict between the engineer and other parts of the production and management team in the typical television setting. Many of these conflicts have forced the engineer to take a purely secondary, almost mechanical role in television production. In some operations engineers have made the mistake of wholly abdicating their creative potential. There are several typical reasons why station management, producers and production staff have not allowed the engineer to get involved.

### **Creative Time Cost**

It has been mistakenly felt that it is too expensive to give the engineer a little "creative" time with his equipment. On the contrary, if the engineer knows his equipment and what it can do he can often speed up program production and offer suggestions to the producer. Such "creative time" on machines can save thousands of dollars in overtime and production waste if properly communicated to other members

of the staff.

### **Understanding Equipment**

As technology changes, many producers (even former engineers) are left behind in their understanding of what equipment will do. Many never knew the full potential of the most basic equipment and are afraid to admit it. This leaves a tremendous communications barrier between the engineer and producer.

The engineer often is not willing to help a "know-it-all". On the other hand, the producer may be too proud to ask for help. Such problems can be headed off by establishing a regular open channel for engineering feedback. The engineer should be brought into creative think sessions before the production takes place. There he can offer suggestions and provide technical insight. An engineering creative liaison inserted at this point can be the key to working around costly production problems that otherwise might have developed along the way.

### **Psychological**

In most television stations there are psychological hierarchies established which make the engineer a



**Fig. 2** Baker (left) and Jim Boyd, CE for WEWS-TV, new program special effects problems.

subordinate in the production process. Any good producer knows this is a highly ineffective method of operation. The production effort must be a team effort.

The producer should ask for help and the engineer should offer it. The frequent sullen conversations between engineering and management or production in which the engineer says, "It's your job to tell me what to do" are telltale signs of inbred psychological trouble.

Time pressure is often a factor that limits creativity on both sides. Facilities are overscheduled at most stations and everybody wants everything at the same time. This is often one of the most difficult problems to solve. Someone with authority must be in charge of scheduling and allow some breathing room.

Even in the most ideal situations facilities are always pressed. The engineer must take it upon himself to put out the effort to get as much done as possible or suggest alternatives. Constant complaining that there isn't enough time solves no problems.

Non-openmindedness of management is a frequent problem. Some managers just refuse to think of the engineer as having a brain. The

only way to beat this situation is for the engineer to leave or show how sharp he is. One or two eager engineers can often show even the most belligerent management that technical opinions should be considered.

Poor communication is too often a problem in the professional communications industry! Channels are not developed or engineers do not try to get into the information flow. Only one or two good men are needed to represent a department and increase the information flow. Sometimes memos or a good chief engineer as a communication liaison are needed.

#### ***It's Your Move***

Engineers have not been willing to make the first move. Often engineers and technicians sit around and complain about management,

the station and their situation, becoming paranoid about their creative potential. The best bet for these people is to stop complaining and start working on establishing a better rapport with management.

It is up to everyone involved in the local station to take up the challenge of improving the psychological climate and improving communication so that the engineer might assume his rightful place in the production hierarchy, allowing for maximum productivity at the station. Morale is always a problem at creative operations (which includes every television station in the U.S.). A typical statement at stations around the country is, "This is the nuttiest place that I have ever worked!" No matter what one does, employees will be unsatisfied or disenchanted. Often such feelings run far deeper than the immediate work

#### **Management Highlights**

No one understands the assets and liabilities any better than the staff engineers. When brought into the production picture, they can bypass impossible productions and enhance otherwise lackluster assignments when you run an open channel station.



**Fig. 3** Jim Evans (left) Studio Manager; William Baker, Executive Producer; and Jim Breslin, Director, discuss technical potential of new lens on a studio camera and how to make the program run smoothly. The entire engineering and production crew take part in all production decisions for major shows.

situation and psychologists find it very difficult to give people fulfillment in a society of complex interrelationships. However, we do know that creative people do respond to the creative challenge if they are treated in the proper way. The rules are simple:

**1. Give the creative people a chance to do their thing.** For example, Jim Bloyd, Chief engineer at WEWS-TV, Cleveland, allowed a top videotape editor to produce his own promo for a major station production on the recommendation of a producer. The result—an exceptional piece of work in a minimum of time. Most good videotape operators can do a superb job with only general instructions from the production staff. It is often the engineer who has artistic control anyway as he knows the equipment far better than does anyone else at the station.

**2. Don't be critical of the creative effort of men assigned to do jobs on their own.** Management often makes the mistake of assigning a creative operator a task only to criticize the work after it has been completed. **Nothing can be more stifling to the creative process.** Once criticized for a project done on his own, he'll never assume such

a project again. It's like telling an artist that he used the wrong color paint or that you don't understand the message. When making creative assignments, one must take the chance and hope for the best.

**3. A simple compliment or a "job well done"** is often the best communication to creative people on both sides of the camera. Criticism should be specific and only presented with understanding.

**4. Develop an "A" crew where pride is high** and men strive to make it to the top. There is no greater pressure than that of peers, even in an engineering department. If a crew develops a sense of pride, the sky's the limit on productivity.

**5. Respect for senior men in the organization is important.** In a time when only young hot-shots seem to get ahead, we must remember that experience is still one of the very best teachers. Some of the less agile old timers can do the job better than the kids. Give them respect and often they come through.

**6. Finally, reward a good job with positive reinforcement.** It can range from a "thank you" to publicity for the creative performance in local professional organizations or in-house organs. It's great to let top management know that a

certain engineer did an outstanding job. But beware, once an engineer finds out that someone in middle management takes credit for something that he did, you'll never see a good piece of work from that man again.

For the chief engineer it is important to remember that there is more to a technician's job than maintenance and repair. As equipment becomes more sophisticated it frees up operators for less routine and more creative functions. Listen to the staff and not the equipment salesmen as to what equipment will and will not do. Go to bat for the men and support creative time with equipment.

Promote an atmosphere which doesn't allow a technician to be treated like a slave to production staff members. And remember, if the crew knows that you're behind them 100 percent, they'll never let you down.

### **New Techniques**

The manufacturer should stress not only technical aspects of his equipment but also the production capability. Too often engineering schools and clinics established by the manufacturer are only for installation and maintenance and not

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for production. As manufacturers hear of new ways of using their equipment and as new tricks of operation are discovered, they should be promoted and communicated to the clients. Engineers at local stations should be encouraged to report new techniques to the manufacturer, and financial or psychic rewards should be provided.

Finally, whether the reader is a chief engineer, manufacturer, manager, operator or production member, it should be remembered that the engineer is not to "carry" incompetent producers or production people. A watchful eye should be kept for such situations. This is one of the greatest limiting forces for a creative atmosphere. Attempts should be made to develop creative sessions before one enters production where the engineer is allowed to participate. If the engineer knows what is to be done in advance he can often suggest short cuts and save valuable studio time and money. Keep in mind that the engineer and technician are often the only real creative link left in the production process. Listen to his suggestions and implement his ideas. □

**Editor's Note:** What it comes down to is this: while the station is serving its audience, it also must make money. Yet when you think about it, you can recall that at too many stations the engineering department gets into the production act only after the fact. And if the product is poor, engineering picks up the tab...even though no one thought to ask engineering if the production ideas could be successfully implemented through existing equipment.

The key problem in too many stations is that personal pride becomes a roadblock to profit and powerful productions. You can, if you will, stand back and wonder how a station can succeed when there is such a lack of teamwork.

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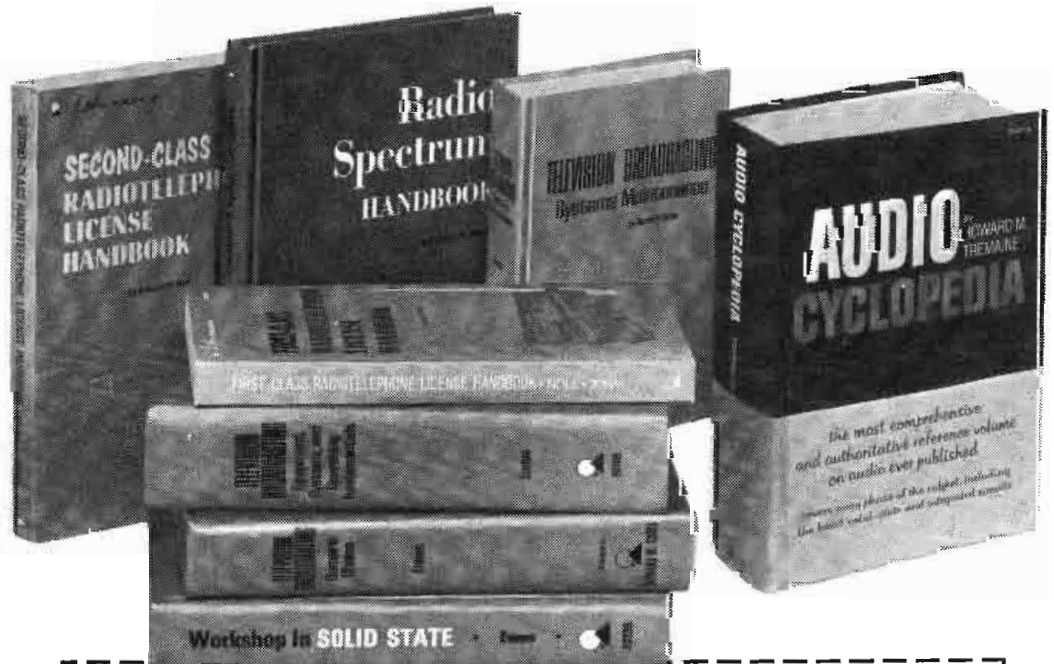
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# Call WLCC...they'll answer

By Dave Copeland\*

Lincoln Christian College solves the problem of getting a lone operator's attention for phone calls, intercom, and opening doors without distracting from the program content.

Many times stations are faced with the situation of having a lone operator several hours at night. This presents a problem of his being in a fairly sound proof studio and perhaps on the air when the phone rings. It may be in the office area or perhaps it's that special news number and someone is calling with a beeper.

Since a bell or buzzer doesn't sound so great on the air or for interrupting production when you finally have gotten it all together, some other signal must be used. Ruling out shocking the operator with electrodes in the chair, we went to lights. Flood lights can even be seen in two adjacent studios, for someone who is fairly alert to the surroundings.

The interfacing from phone line voltage to 115VAC has to have good isolation, or you will have some explaining (or worse) to do.

We have found that a 10,000 Ohm relay with varying amounts of series resistance works fine. The resistor is adjusted up so that the light won't flicker on when dialing out. Don't increase it too much because a varying ringing voltage (70-150V in some places) can drop on you. Some circuits don't require any series resistance and you may even have to stretch the spring to cut down on tension. I've also placed the contacts closer together to obtain a longer on-duty cycle.

The picture shows a rather crude shock mounting, but it did work for a couple years. Should you choose the relay method, a base with a

three or four point shockmount would do. Rubber grommets make good, inexpensive devices for this. You might wonder, why all of the worry about mounting? That ringing voltage is 20 Hz and relays make a buzzing sound which is amplified by a case if it is physically connected. A piece of plastic tape is used on the magnet head to cut down on the chattering sound. You could mount these in another room and not worry about the problem, but who has another room close by? When the mike warning light is added to the case, holes need to be added for ventilation. Rubber tends to get hard after exposure to heat.

Another small, but very embarrassing point is the vertical rather than horizontal positioning of the door light. Someone else had removed and replaced it and I didn't get it straightened out before the picture was taken. You can make this adjustable by pulling the center connection in the socket out a little to catch the end at the right place. Do use a non-conducting device for this when the power is on. The flash of light and flying molten metal might be a little heavy music for your heart.

Our studios have three lights, for the telephone, intercom part of phone system and door bell. Also, an orange light (thin coat of spray paint) goes on for the master control mike, as it is in a multi-purpose room. Ever have a person wearing phones where he can't see or hear you? And while you are on the air, he starts singing along with the record he is auditioning, off key even. You can't simply switch off the mike and yell at him because the phones are already doing that quite well. We no longer have the record library in the room but the light still serves its purpose to avoid other problems.

The door bell light system is rather unique in that it also works a chime in the outside office on a

two wire system. This came from necessity due to prior wiring in an already full conduit. The relay coil is used as a choke in the power supply for the chimes. It makes a very distinctive, decaying burst of light and can easily be differentiated from the other two lights without even looking up. All three have distinctively individual flashes.

Our telephone intercom has a 9V DC lamp signal. A relay on this produces a blunt on-off flash of about 1 second duration.

These relay contacts do have to be cleaned and sometimes adjusted every few months. A solid state device can be used to avoid this and the need to suspend relays on rubber mounts to avoid noise transfer. The trick is to get that very important isolation between circuits. And, to our rescue comes Motorola with MOC 1000-MOC 1003 (also known as 4N25-4N28) and MOC 1200. The first four are called "optoelectronic couplers - infrared light emitting diode phototransistor coupled pairs." MOC 1200 has "photo darlington coupled pair" added to its tag. It has a transfer ratio of at least 100 percent compared to 60 percent on the others. The device can be viewed on our test setup picture, the six pin DIP integrated circuit. Prices on all devices range from \$.98 to \$1.85, that probably turns you on. They have been out for less than a year but are available at large distributors. This Digi Designer is really a time saver and has much more reliable contacts than any other type which I've tried or heard about. My work bench carpet almost hides the wires. The use of the carpet is another good idea which was given to me by a former employer in the TV repair business. You can save a lot of good finishes that way.

The entire circuit is rather simple, with an LED triggering our phototransistor, which switches on

\*Technical Director, WLCC-FM, Lincoln Christian College, Lincoln, Ill.

a driver device and on to the SCR or TRIAC. The spec sheets say that the unit will drive an SCR directly, but I needed more sensitivity and added the extra stage.

Inputs from the phone company are in the neighborhood of 150 Volts so I figured on 6 ma. through the LED. The peak diode current is 3 amps for a micro second so we are running well below that and the 80 ma. continuous rating. You don't have to worry about loading the phone line because this circuit has a minimum input resistance of 10K Ohm. Also, isolation is in the order of 10<sup>7</sup> Ohms and voltages of 500-2500V. D<sub>1</sub> is used with the idea of protecting the LED against reverse voltages (any 1KV PIV unit will do). The 9V intercom circuit

will have a considerably lower input resistance (1K with a 10K pot) which will be much less load than the normal light bulb and buzzer. R<sub>1</sub> is used in the unit for varying the unit's sensitivity and anything in that area (+ 200K Ohm) will work for varying amounts of LED current. I tried to keep the normal down as a protection factor.

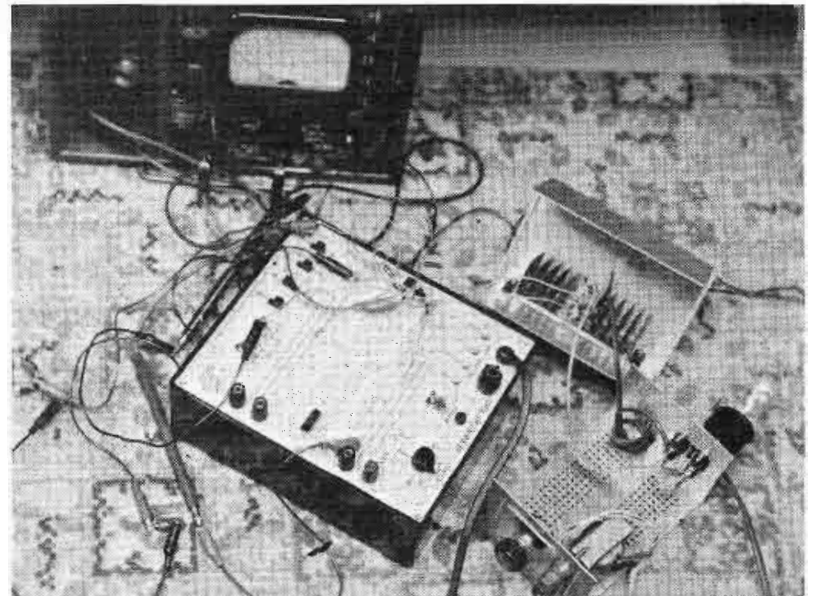
The amplifier circuit is borrowed from the Motorola specs and it works fine. I tested this circuit with a comparable load of 5 phone lines to the TRIAC and it works fine. (An SCR will also work fine here.) Our circuit used 5V for the chip and driver but the spec sheet shows 10V so anything in the area is O.K., with possible adjustments in R<sub>1</sub>.

By using more than one input, you are performing the basic OR function in logic. An earlier development of this device used some of the 7400 series gates and the TRIAC was driven directly from a SN7420.

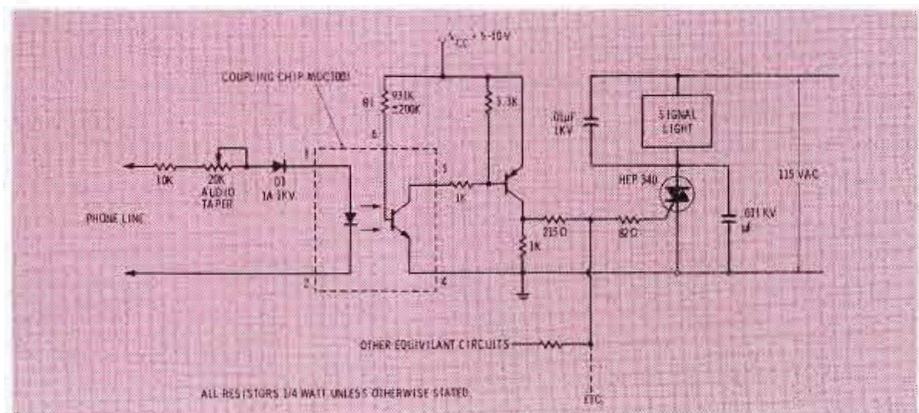
It is very important when working with these devices to keep all inputs loaded, not floating. A loose ground connection on the chip's power will also give some very baffling indications. Use of the Digi Designer's four indicator lights saves on meters and allows inter-stage monitoring. This can save the beginner, and veteran, a lot of worry. Many hours of my soul searching on projects have been the result of some connection being loose and not having taken or been



**Fig. 1** Barbara Stierwalt reacts to the phone light and answers the line. Note that by the signal lights, the operator can't miss answering the phone, the intercom, or the door . . . and all silently.



**Fig. 2** Still in the experimental stage, the author uses a Digi Designer to design the circuit.



**Fig. 3** Phone signal light system schematic. All resistors are 1/4 Watt, unless otherwise noted.

able to take internal measurements to locate the problem. Instead, you begin to think that this digital stuff is only for computers. But, let me assure you that digital is like tinker toys, on or off. Granted, some people have some complicated tinker toys but it is still on and off that counts.

A couple other notes of basic, practical interest in IC work is that these things will normally take a lot of heating without damage. And, it is not a good idea to go around with rings on when the circuitry has power. You can short out things.

Don't worry about shocking yourself because the power is only 5V. Some chips do get warm enough to burn you under normal operation. Removing or replacing a chip when the power is on can cause some fatal transient spikes for other chips or you can slip and short something out.

You probably have a multiple circuit phone system. In that case, there is usually a cable pair which contains ringing signal for all circuits. This is new information for me and will avoid wiring extra inputs for your TRIAC. It is very

helpful to have good TELCO people for some of this information, when the time comes.

Our three TRIACs were mounted on an available 6" x 3" stock of heat sink, with fins. The heat dissipation is very low and much less could be used.  $C_1$  and  $C_2$  are for de-RFing the TRIAC circuits. Due to the nature of the duty cycle of the phone light, I used a 150 W bulb and 75 W units were used in the others.

We are happy with this system and hope that you may find a couple good ideas in it. □

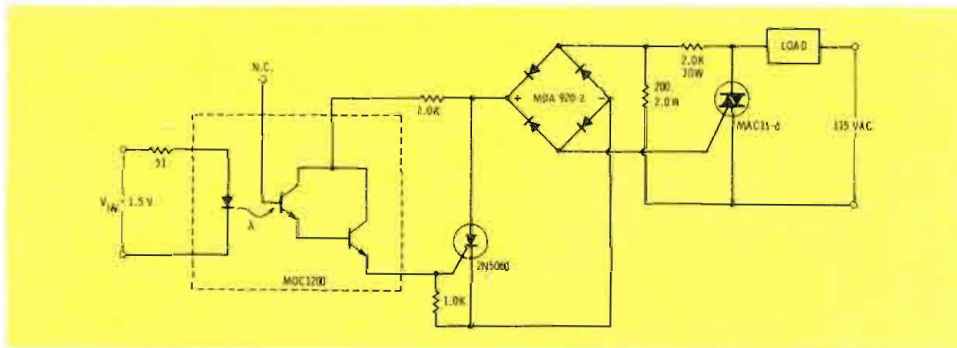


Fig. 4 Voltage controlled triac.

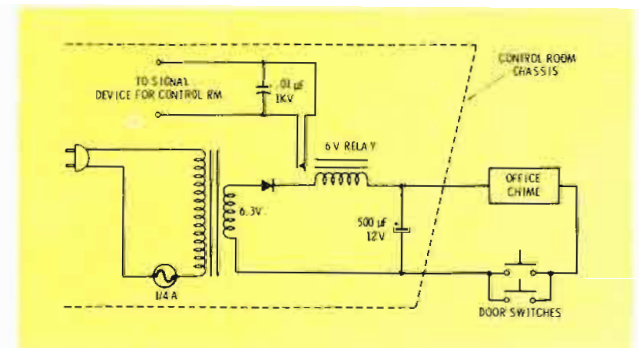


Fig. 5 Signalling device for outside door.

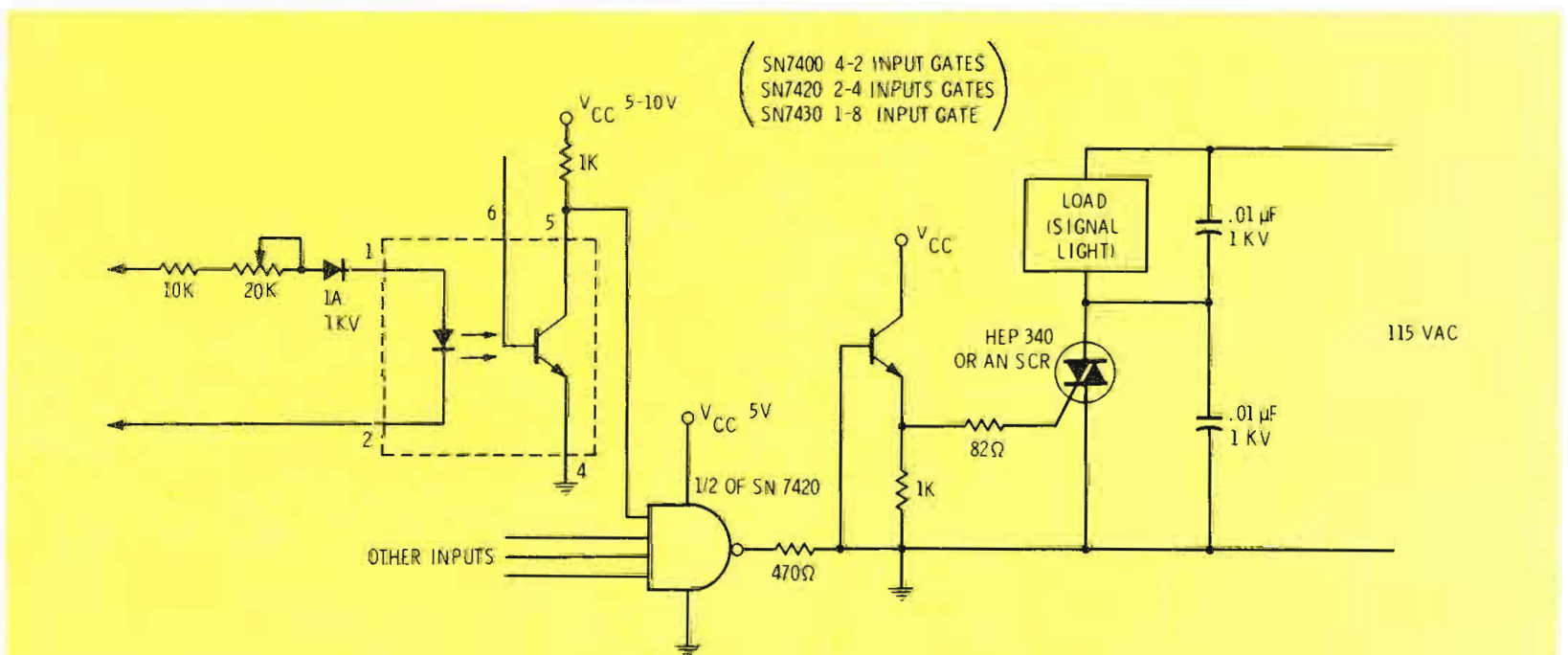


Fig. 6 Extra circuits schematic. The IC's amp is an inverter, which places a high on the input of the SN7420, and the total circuit becomes an OR switch with 4 inputs. If an amplifier stage is used, it needs to be a non-inverting type such as used in our first circuit. A SN7430 has 8 inputs, and any inputs not used should have a 470 Ohm resistor to  $V_{cc}$  (+5V).



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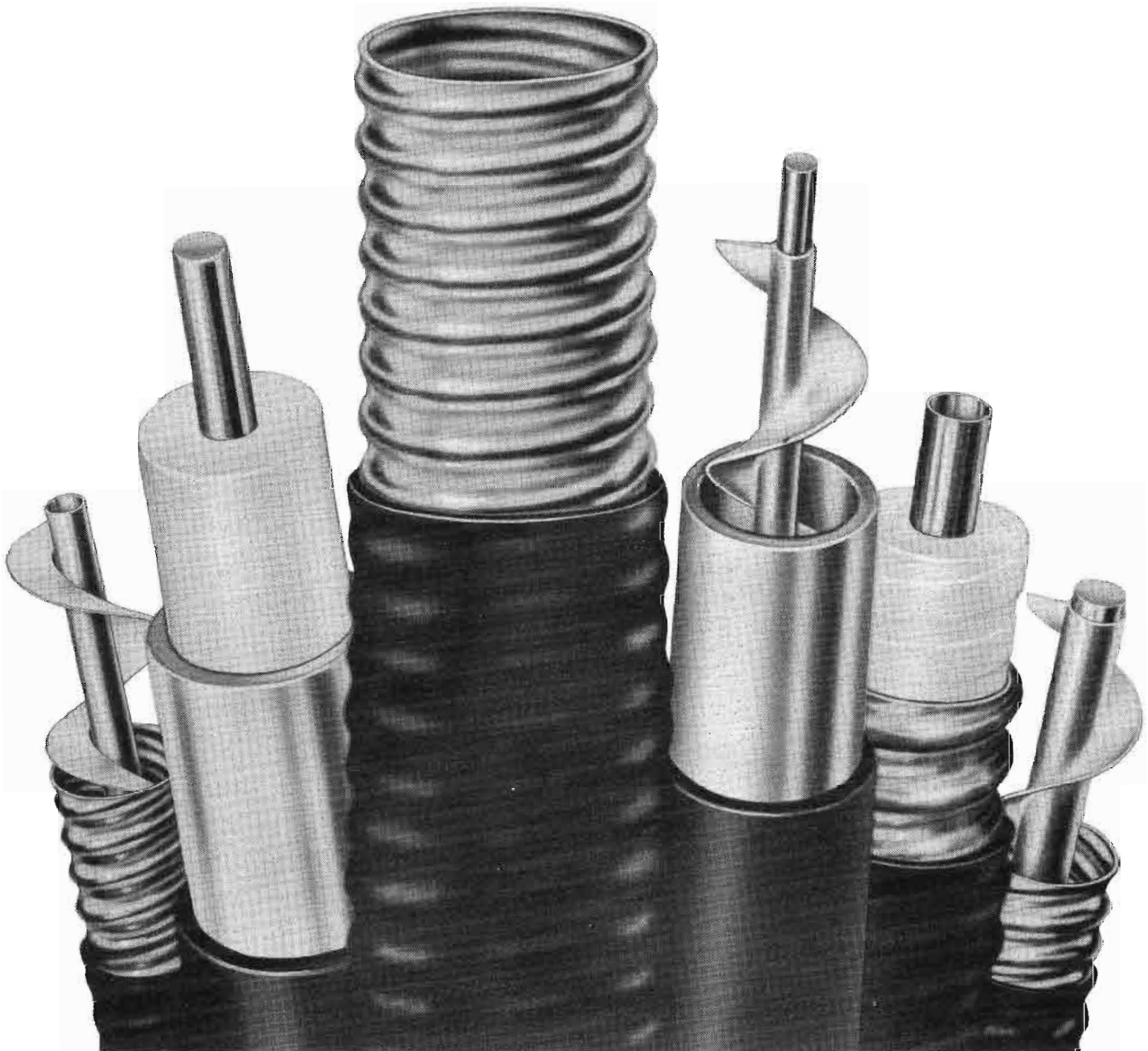
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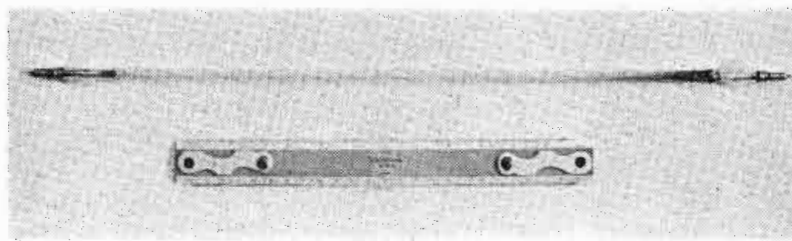
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# Public Broadcasting Authority Switches to Tower Strobe Lights

Fig. 1 Linear flash tube shown here compared to a ruler.



By John T. Wilner

Director of Engineering, Public Broadcasting Authority, State of New Jersey.

The FCC and the aviation industry have been investigating a lighting system for broadcast towers that would be more visible during bright daylight conditions, nighttime conditions and low visibility conditions. One of these systems depends on a xenon lamp operating under strobe lighting conditions.

When the New Jersey Public Broadcasting Authority applied for a CP to construct two 1,000 foot towers for their Trenton, New Jersey, and Camden, New Jersey, transmitting plants, a number of objections were received from the aeronautical and citizens groups. They felt that such towers constructed in the heavily traveled air corridor between New York and Philadelphia, and Philadelphia and Atlantic City might have an adverse effect on aircraft safety.

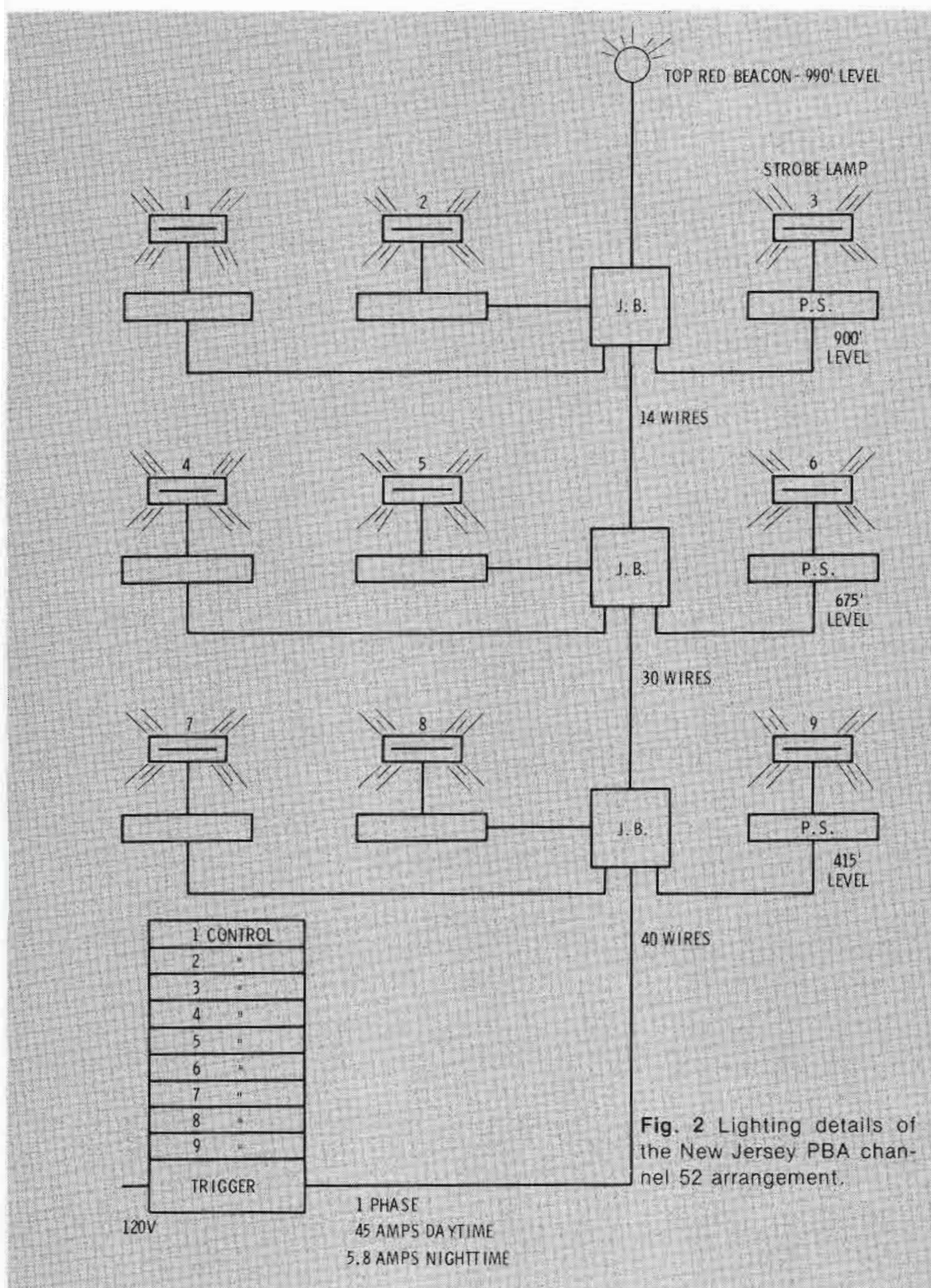
An understanding was reached with all parties whereby the NJPBA agreed to install high intensity strobe lights on these two towers when they became available, when cost and maintenance became reasonable, and when they were approved by the FAA.

## FAA Specifications

FAA Advisory Circular 150/5345-43A: FAA/DOD-L856 has proposed that tall broadcast towers be equipped with the new high intensity strobe lights. Pertinent specs in these circulars are:

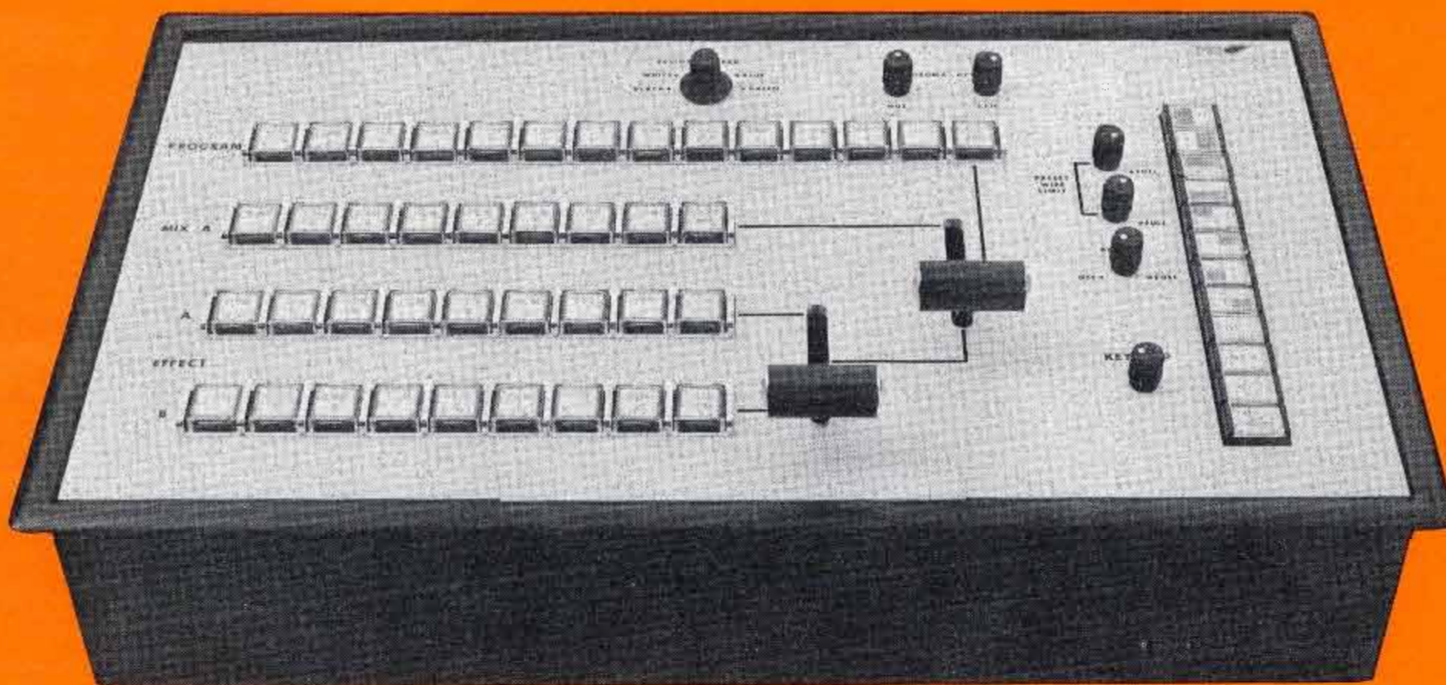
1. **Intensity:** Daytime 200,000/100,000 candellas \*1 Nighttime 1,000 candellas
2. **Color:** White
3. **Beam Adjustment:** 0° to + 8° above horizon
4. **Lamp Life:** One year continuous operation

\*1 Candella is a unit of light now generally replacing former candle power as a unit of light intensity.



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5. **Photocell Control:** In the automatic condition to change 3 to 1/2 ft. candles ambient light
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7. **Flash Duration:** 90 to 5,000 microseconds
8. **Flash Sequence:** Simultaneously \*2
9. **Circularity:** 360°
10. **Vertical Angle:** 3° at 50% point, 10° at 10% point
11. **Levels:** Depending on tower height. See FAA Circular 70/7460-1
12. **Climatic Conditions:** -50° C to +55° C. including high humidity conditions.

### Theory Of Xenon Flash Operations\*

The high intensity light source used in this system is a linear flash tube of quartz filled with xenon gas (Figure 1). Xenon flash tubes are highly efficient light sources which convert approximately 16.5 percent of the electrical energy applied to it into optical energy. Similarly, an incandescent light source converts approximately 3 percent of the elec-

\*2 To differentiate between broadcast towers, landing strips, and bridges, it is proposed that (a) towers will have all lamps flashing simultaneously; (b) landing strips will flash sequentially; and (c) bridges will flash in an oval pattern.

\*Instruction Book - Dielectric Communications, Raymond Maine.

trical energy into optical energy.

Another important attribute of the xenon flash tube is its ability to produce high peak light output of short duration. Approximately 500 Watt-seconds of electrical energy is dissipated in 1.5 milliseconds, resulting in a peak power level in the flash tube of 333 kW.

In its normal state, the xenon gas in the flash tube is non-conductive. The electrical discharge necessary to produce the intense brilliant burst of light is initiated in the flash tube by meeting two conditions: First, an electrical field is applied to the inter-electrode space of the flash tube by connecting the flash tube across a capacitor charged to a DC voltage. The capacitor voltage is held below the selfionizing potential of the tube. Second, carriers of electrical charge are introduced into the inter-electrode space by applying approximately 30,000 Volts to a fine nickel wire laced on the tube along the entire length of the inter-electrode space.

After these two conditions are met, the gas in the tube is ionized and an arc is formed. There is a surge in current in the tube as the gas suddenly turns into a conductor, and the lamp begins to glow intensely as it goes into electroluminescence. As soon as heavy conduction occurs in the tube, the voltage across the tube begins to fall until the extinction voltage of the tube is reached and the tube reverts to its non-conducting state.

If the capacitor voltage is reapplied before the tube becomes fully de-ionized, the tube will go into continuous conduction, behaving like a short circuit to the capacitor charging circuit. Therefore, sufficient impedance is inserted between the capacitor and the charging circuit.

For reasons stated in earlier, the following components are required for the successful operation of a strobe xenon beacon.

- a. A flash tube housing containing the flash tube and the necessary optical devices to shape the beam. This

assembly serves as the light source.

- b. An energy storage device such as a capacitor which accumulates a charge from a DC supply over a period between flash tube conduction. An air core inductor is used to shape the pulse of energy supplied to the tube from the capacitor.
- c. A charging circuit for the capacitor with its associated controls.
- d. A high voltage trigger source which, when applied to the tube grid, renders the xenon gas conductive.
- e. A timing device to turn on the high voltage trigger at the appropriate time.
- f. A monitoring circuit which serves as a system status indicator for each light unit.

### Installation Details

In the early part of 1972, a contract was signed for the installation of a high intensity lighting system on two of the four New Jersey Public Broadcasting Authority towers. One tower is located just north of Trenton, and the second tower is a few miles southeast of Camden.

Figure 2 shows the tower details of the channel 52 Trenton tower. This installation was completed in July 1972. The top set of three lamps were installed at the 900 foot level of this tower, the middle set of lamps (Figure 3) at 675 feet, and the lower set of lamps at the 415 feet level.

A separate power supply (Figure 4) was installed within 15 feet of each lamp housing. It is possible to install power supplies at the base of the tower but this would require a long run of high voltage cable. Since these towers were designed for installation of additional microwave units, this extra windloading did not represent any problem for the tower.

A control and monitor cabinet was installed in the transmitter building, as shown in Figure 5. This cabinet controls power to the system, allows manual or automatic

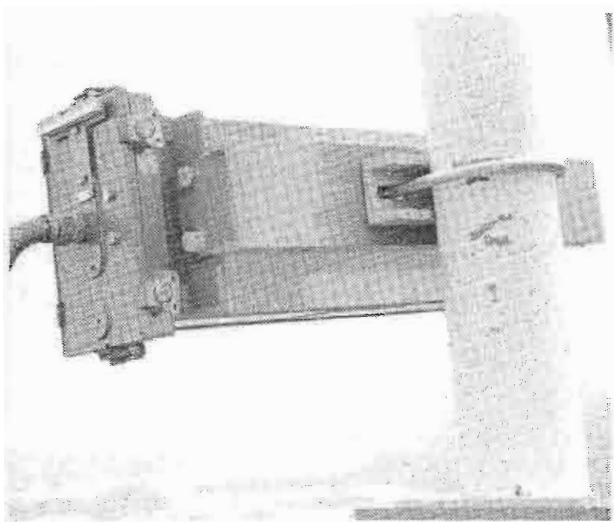


Fig. 3 These are the middle set of lamps, installed at the 675-foot level.

operation and has a pilot indicator which shows power delivered to the power supply and a blinking light for lamp status.

The daytime power demand for the nine light system is 9400 Volt amperes (4500 Watts), while the nighttime demand is 700 Volt amperes (375 Watts), all at 120V AC. The nighttime power does not include the top beacon which obtains its power from the normal red light power source.

FAA requires that the top red beacon (atop antenna) remain operational during night condition. It is hoped that some time in the future, a small strobe replacement for the red beacon will become available. We have modified our red light system so that the top beacon is always operational at night when both the strobe lights and red light systems are in operation.

FAA stipulates that when visibility is more than five miles, daytime intensity of the lights can be reduced to 100,000 candellas accordingly. A manual switch has been incorporated on the control panel for each light so the lights can be changed from 200,000 candellas to 100,000 candellas. During the nighttime, however, a photocell automatically changes the intensity from daylight level as indicated before to the 1,000 candellas. The photocell has been adjusted so

that the change takes place whenever the ambient light falls to about 3 candle power.

It was necessary that a new conduit be installed to run up the tower.

A 1½" conduit was installed between the control cabinet and the first lighting level. Each power supply requires four separate wires plus two common wires to all power supplies for triggering purposes, together with neutral and control wires fastened together for a total of 40 wires in this 1½" conduit.

Most of the wires were No. 12, but triggering wires were smaller. Between the first level and center level the number of wires was reduced to 30 wires. Between the center level and top level, wires were further reduced to 14. Between each power supply and lamp fixture was a weatherproof flexible conduit which contained six wires plus a ground.

Because of the pioneering nature of this installation, we arranged our control circuitry so that the operator on duty could switch to an all strobe light system or an all red light system or a combination nighttime strobe light and red light system.

As mentioned previously, the red beacon on top of the antenna was energized at night under all conditions.

### Conclusions And Recommendations

After the Trenton installation was completed, the FAA made an inspection trip to the Trenton area in a DC-3 airplane. On board were ten pilots, FAA and local aviation administrative people, as well as representatives of NJPBA. The plane flew in approximately two mile and ten mile circles around the tower, both at nighttime and daytime, as well as dusk. The plane also flew in several directions toward the tower and away from the tower. One of these latter trips was into the sun and away from the sun.

The first trip, as mentioned, was during bright sun daylight hours. It was agreed by all on board that the

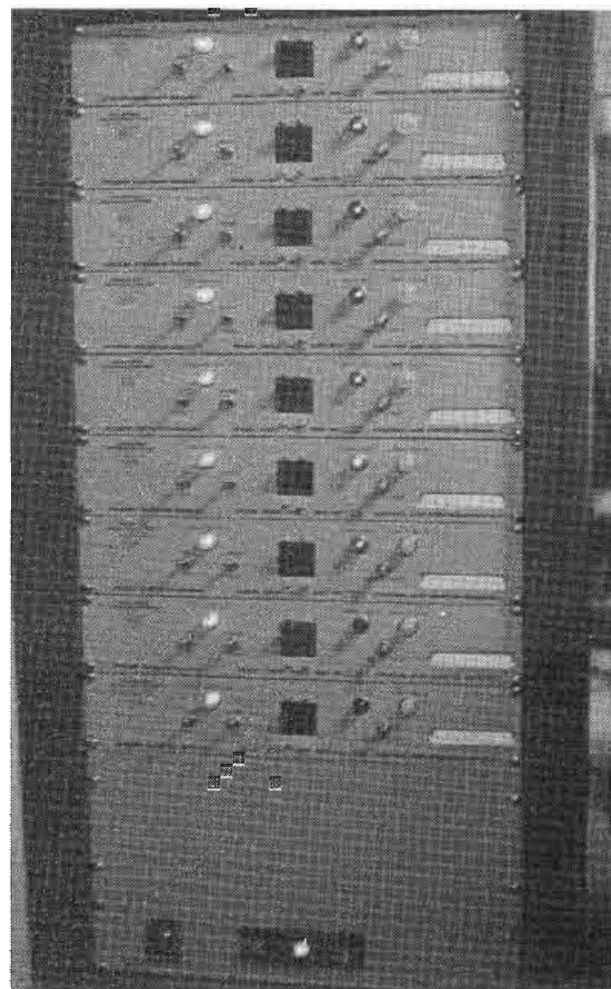


Fig. 5 Tower control and monitor rack. These units control power to the system, allow manual or automatic operation, and a pilot indicator to show power delivered to the supply.

tower was plainly visible during these daylight hours and under all conditions, both when flying circles and straight lines toward and away from the tower.

It was almost unanimously agreed that the orange and white painting of the tower was not visible except when the plane was flying toward the tower with the sun behind the airplane.

Provision was made by the communication system in the airplane to have the operator at the transmitter switch between strobe lights and red lights on command. This enabled us to observe and compare the difference between the strobe lights and the red lights at all times.

During the period from July 1972 to the present — a ten-month period — we lost five of the nine xenon flashing lamps. These lamps were supposed to last one year. The manufacturer has now supplied us  
(Continued on page 49)

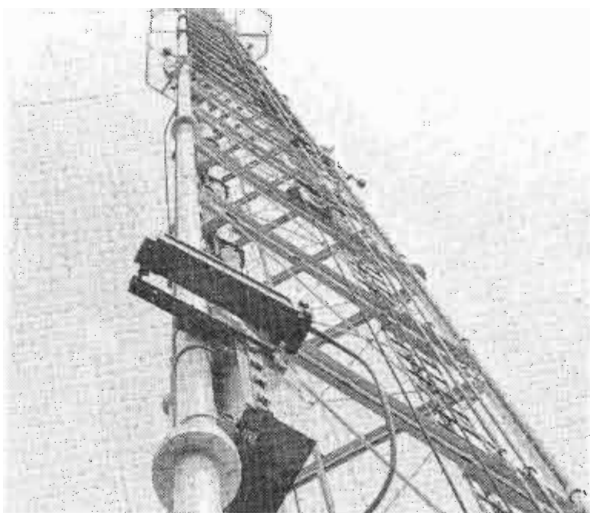


Fig. 4 A separate power supply is installed 15 feet from each lamp housing.

Part 4 of a 4-part series

# Basic digital logic review

By John Lee\*

In the previous parts of this series we discussed digital logic devices and the technologies in which they are implemented. As can be seen in so many of today's products, these devices allow more sophisticated and complex designs than ever before. But inherent in the digital IC, as in any electronic component, is the potential for failure.

Because of the complexity in the functions performed by digital IC's and in the circuits built from these IC's, this potential of failure has an even greater impact on production and service troubleshooting than the analog components which preceded them.

While it is possible to use existing instruments and techniques to find a bad IC, these are woefully inefficient in both the information presented to the troubleshooter and the amount of time required to obtain that information.

A new generation of trouble-

\*Hewlett Packard

shooting instruments tailored to the digital troubleshooting process is now available. These instruments take advantage of the digital nature of the signals involved to reduce the time spent setting up and adjusting equipment and analyzing the information presented. More time is left to study the problem and determine its cause.

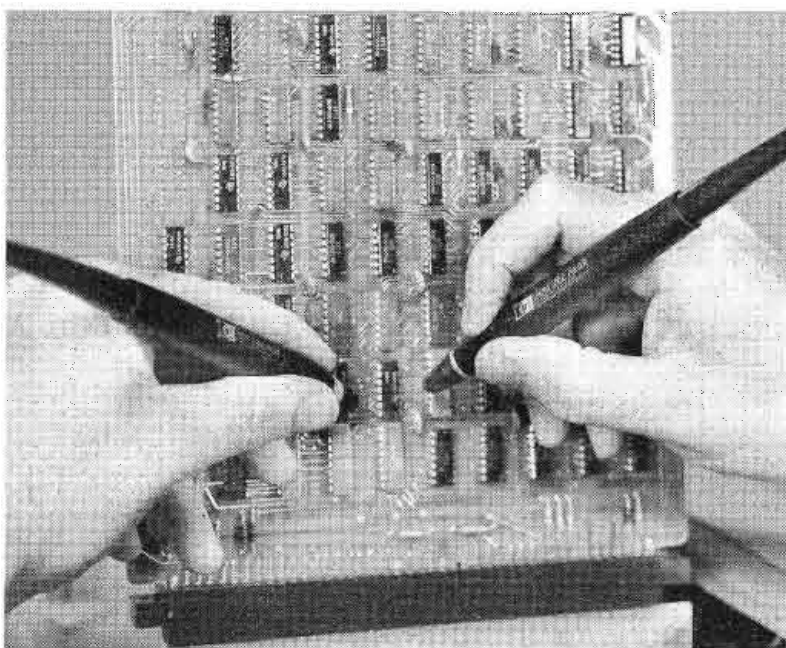
The first of this new breed of instruments is the **logic probe**. Figure 1 shows a set of probes which cover the TTL, DTL, HTL, MOS and ECL logic families. Realizing that digital circuitry operates on relative voltage levels (that is 1's and 0's), it is both time consuming and error prone to view a digital waveform on an oscilloscope and repeatedly decide if the signal is a 1 or 0.

If a TTL signal is above 2.0 Volts, it is a 1, and it is unimportant whether or not the absolute level is 2.4 or 2.5 Volts. Similarly, if the signal is below .4 Volts, it is a 0. Again, absolute voltages are unimportant. The **logic probe** takes advantage of this fact. The **logic probe's** display is a lamp which

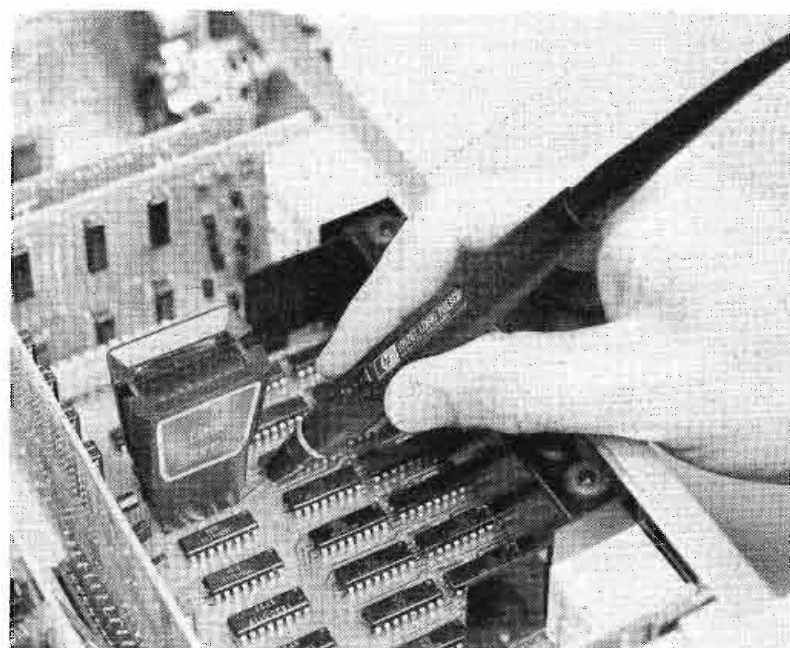
glows brightly if the digital signal is above the high threshold level, goes off if the signal is below the low threshold, and glows dimly if it is between these two levels. This automatic determination of digital state (1, 0 or bad level) coupled with a finger tip indicator means digital signals can be analyzed quite rapidly.

In addition to viewing static signals, it is important to be able to view dynamic pulse trains. It is the nature of digital IC's to either completely work or completely fail: seldom do they become marginal in their operation. This means that the mere existence of a pulse train at an IC's output which is supposed to have a pulse output is enough indication of that IC's proper operation. If that IC had failed, it would have failed catastrophically and no signal would exist.

For example, if the divide-by-ten output of a 7490 Decade Counter is pulsing when a clock signal is applied to the clock input, then that IC may be assumed to be good. It is not important to view



**Fig. 1** This loaded PC board probably looks familiar in today's equipment. New to the scene are the IC troubleshooting aids: the logic probe at left and the logic pulser at right.



**Fig. 2** The logic clip employed here allows the state of up to 16 pins on a single IC to be observed simultaneously. When used with the logic pulser, as shown here, even complex devices can be checked out in minutes.

the pulse train on an oscilloscope to determine that the signal is indeed a divide by 10 output. While interesting to observe, this provides very little useful information to the troubleshooting process and is time consuming.

The **logic probe** provides a constant 10 Hz blinking lamp to indicate the existence of pulse activity for ranges of 10 Hz to 50 MHz. Below 10 Hz, the lamp goes on and off following the signal being monitored. The intuitive relationship of the indicator lamp to digital signal state makes its use both easy and rapid. It allows the troubleshooter's talents to be applied to solving the problem.

One more very difficult problem exists for even the most sophisticated instruments and that is to display a single shot or very low frequency or random pulse. The **logic probe** is able to do this by what is called **bilateral pulse stretching**. This means that a narrow pulse of either polarity (high-going-low or low-going-high) will be detected by the probe and stretched to give a lamp indication. If the pulse was low-going-high, the lamp will blink on. If it was high-going-low the lamp will blink off. Pulses as narrow as 2.5 nsec can be detected at the user's finger tip

with the **logic probe**.

Due to the complexity of the functions performed by digital IC's today, it is often necessary to be able to view several signals on a given IC simultaneously.

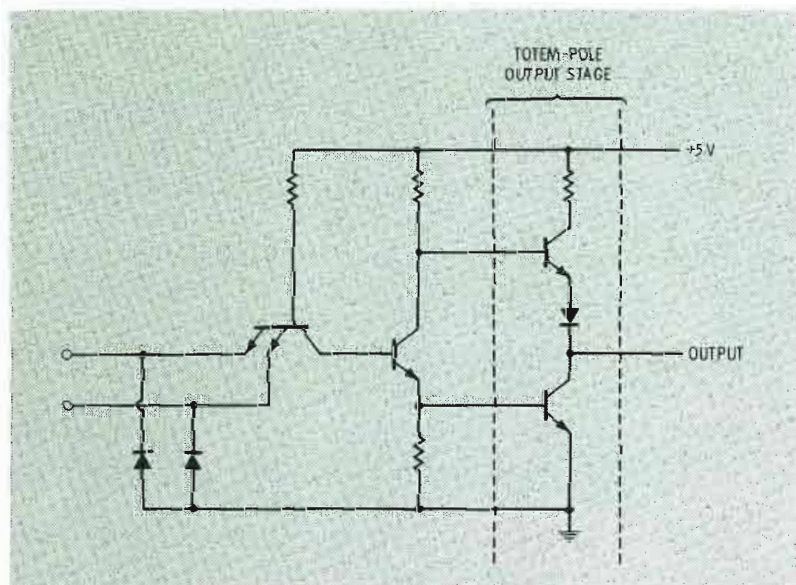
Figure 2 shows an instrument designed to provide this capability. Called a **logic clip**, up to 16 signals can be observed simultaneously. The logic clip has a single threshold to determine the state of the signal. An LED is turned on if the signal is high and off if the signal is low. The **clip** has internal power seeking circuitry which allows it to be attached to the IC in any orientation. When troubleshooting complex devices such as the 7490 Decade Counter mentioned earlier, the logic clip can really save time. Together the logic probe and logic clip form half of the stimulus-response testing team required to be an effective digital troubleshooter.

Figure 3 illustrates a problem created by the TTL logic family. At any node in the circuit, a TTL output will be driving a TTL input. The totem pole arrangement (the term given to the two transistors, resistor and diode output stage) of the TTL output is a low impedance. If the node is in the low state, this output is a saturated transistor to ground.

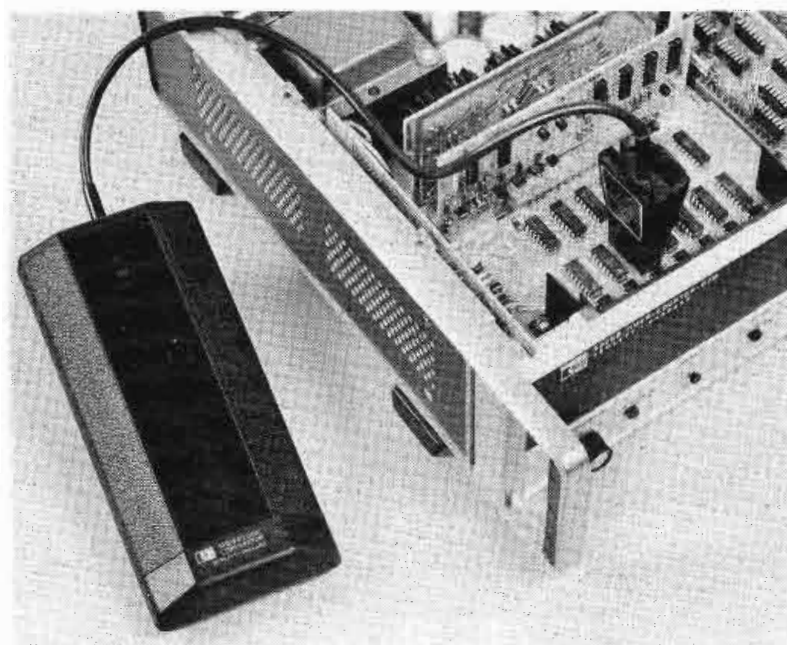
To be able to perform in-circuit stimulus response testing as required in the time proven half split technique, it is necessary to override the low impedance output! It can be done, but many parameters must be taken into account. Proper amplitude must be set along with proper polarity. In most cases a single shot pulse is required and this pulse must be narrow enough to insure that the IC is not damaged. For about \$2000 and 30 minutes effort, such an instrument can be set up to perform the task. Or another approach can be used.

Since it is only the output that is a low impedance causing the problem, its pin can be lifted from the circuit or the circuit trace cut. This eliminates the need for an expensive pulse generator, but does not eliminate the need to set up proper amplitude and polarity and to generate a single shot pulse. In addition, the act of cutting traces or pulling leads increases the probability of a future failure in the circuit.

A better alternative is presented by a **logic pulser** (Figure 4). This is a device for TTL or DTL logic that will generate a single, well defined pulse of proper amplitude and polarity with enough power to override the low impedance output stage but with short enough dura-

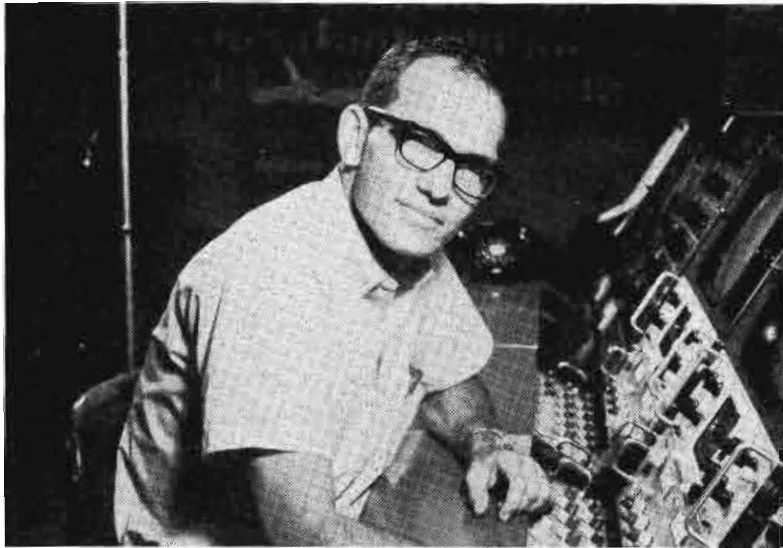


**Fig. 3** The totem-pole output stage of TTL devices presents a severe problem to in-circuit stimulation. In the low state, the output is a saturated transistor to ground (5 to 10 Ohms), requiring a powerful but short pulse to pull it to the high state without damaging the IC.



**Fig. 4** The logic comparator uses a known good IC to compare against suspected IC. A rapid test of all the IC's in the circuit will quickly focus on the problem area.

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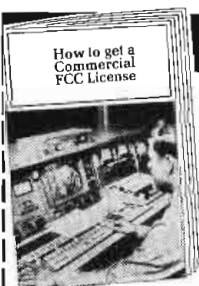
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## PEOPLE IN THE NEWS

### Broadcast

**Theodore R. Lucas** has been appointed as Instructional Television Coordinator for the Central Educational Network, with headquarters in Chicago....The annual PEEPP Award for outstanding service to the private practice sector of the engineering profession has been presented to consultant **Billy T. Sumner**, P.E., of Nashville. The presentation was at the 39th Annual Meeting of the National Society of Professional Engineers in Chicago. Sumner is a principal in the firm of Barge, Waggoner, Sumner and Cannon, consulting engineers and planners....**Harry Greenberg** has been appointed sales manager for Long Island's new commercial television station WSNL-TV scheduled to begin "air time" this fall...**Jack Sumroy** has joined WSNL as vice president in charge of programming and production.

**Tom Needles** has joined Koss Corporation (OTC), Milwaukee, as senior vice president-marketing....**Robert W. McAll** is now with CBS Laboratories, Professional Products marketing staff as Product Manager....**E. Carlton Winckler** joined Imero Fiorentio Associates as Senior Production Consultant. He is also adviser to IFA's Department of Studio/Production Systems and head the firm's new Training and Seminar Division.

**Ronald H. Fried** and **Daniel J. Yomine** have been named senior vice presidents at International Video Corp....New Midwest district sales representative for IGM, Bellingham, is **James Opsta** who will handle sales for the firm's audio control equipment in Illinois, Iowa, Minnesota, Missouri and Wisconsin....**Michael Cooney** has been appointed Vice President of Finance and Administration of Philips Broadcast Equipment Corp...**John Boosey** is the new General Sales Manager of the Power Conductor Division of Essex International, Inc.

**Warren G. Bender** has been elected president of Telecommunication Engineering Corporation....**Billy L. Cook** has been appointed Manager, Theatrical/Architectural Lighting and Control, Berkey Colortran, Inc....**James A. Lundquist** has joined Fidelipac as Chief Engineer with responsibility for research and development....Rupert Neve Inc. announced the appointment of **Arthur A. Schubert, Jr.** to the position of Chief Development Engineer for Neve Electronic Laboratories Ltd., Melbourn, England and **Barry J. Roche** joins Rupert Neve Inc. in the senior engineering position.

Television Microtime, Inc. has announced the promotion of **A. Norman Into, Jr.** to President, **C. Robert Paulson**, Vice President for Marketing and **David E. Acker**, Vice President for Engineering....Dictaphone Corporation has appointed **Robert L. Baker** as Manager, Marketing Services of its Scully/Metrotech

(More...)



tion not to damage the IC. The logic pulser is capable of sourcing or sinking .75A for 300 ns to ensure a change in state of the node pulsed. Without setting any controls a pulse of proper amplitude and polarity will be generated with the push of a button. Low nodes are pulsed high automatically and high nodes are pulsed low. Used with the logic probe and logic clip, complete in-circuit stimulus response testing becomes easy.

But still another advantage can be given to the digital troubleshooter with the logic comparator (Figure 5). The logic comparator uses a component comparison technique to rapidly isolate the area of the circuit that is causing the problem. A known good IC of the same type as the IC to be tested (not necessarily the same manufacturer, for example, a 7400 made by Texas Instruments is the same as a 7400 made by Fairchild) is inserted into the comparator. The comparator's clip is attached to the IC in the circuit to be tested. The input signals which stimulate the IC in the circuit are used to stimulate the reference IC and the output of the two IC's which are causing the problem. The logic probe, clip, and pulser can then be used to rapidly analyze the cause of the failures.

There are three common failures which can be easily detected using the logic probe and pulser. The first is an open output bond (an open inside the IC on an output pin) or an open circuit trace. When an open exists the IC input attached to the open node is allowed to float. In TTL circuits these inputs will float to around 1.4—1.5 Volts. Since the logic probe has both a low, high and bad level detection (remember low = off, high = bright, bad level = dim) this bad level can be easily detected. By probing the inputs an open will rapidly be detected as a dimly lit display.

The other two common failures are shorts to Vcc and ground. These can easily be detected using the logic probe and pulser. While the logic pulser is powerful enough

to override even the low impedance state of a TTL output, it cannot inject a pulse into Vcc or ground. Thus a short to Vcc or ground can be quickly detected by attempting to simultaneously probe and pulse a suspected node. If the probe detects no pulse then the node is definitely

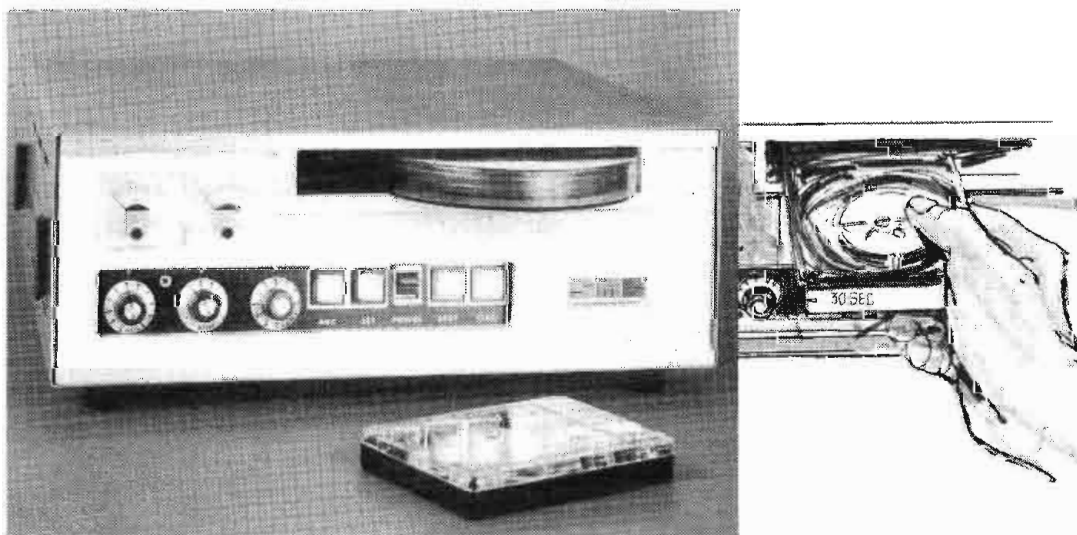
shorted.

Thus, by applying the logic comparator to isolate the problem to a set of IC's and the logic probe, pulser and clip to analyze the IC's, the digital troubleshooter can rapidly get to the cause of the problem □

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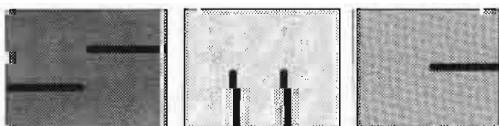
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CHANNEL TWO TELEVISION COMPANY

**KPRC TV**

July 13, 1972

Mr. Morris T. Covington  
Director of Research  
Taft Communications Systems, Inc.  
4808 San Felipe Road  
Houston, Texas 77027

Dear Morris:

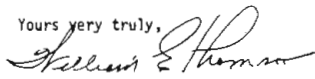
This long overdue letter will let you know how very pleased we are with the continuing good service from our Taft Audio Distribution Amplifiers.

As you know, I had six of these amplifiers on the test bench for six weeks and abused them in every way possible. I did not experience a single failure; in addition, they held their specifications in every way.

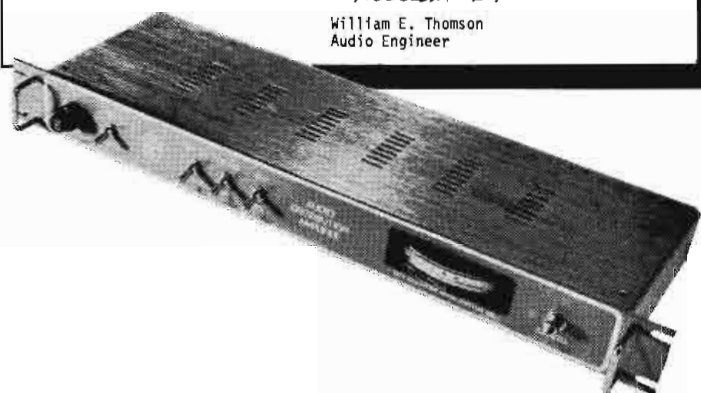
I had evaluated several "well-known" distribution amplifiers before I tested the Taft DA, and I knew then that this was the DA for us. It is right in every way: size, individual power supply, number of outputs and performance. After several months of hard and continuous service, I am still well pleased with all fifty two of them.

I will recommend your Model 5002 Audio Distribution Amplifier, and also your Model 4002 Monitor/Power Amplifier without a moment's hesitation.

Yours very truly,



William E. Thomson  
Audio Engineer



Note these unique features of the Taft Model 5002 Audio Distribution Amplifier:

- (1) 18 isolated 600 ohm outputs (80 db)
- (2) 20-20 KHZ  $\pm$  0.5 db, 0.5% total distortion (with "EQ" and "Rolloff" in flat position)
- (3) Equalization and Rolloff feature provided for signal conditioning before distribution
- (4) Input and outputs are balanced
- (5) 20 db gain (can be increased to 40 db)
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divisions....**Albert Alperin** has been appointed Vice-President and General Manager of the new International Division of the GBC Closed Circuit TV Corp....**Joe White** and **Fred Kain** have been named eastern field sales manager and western field sales manager by Davis Manufacturing, Division of J. I. Case.

### CATV

**George A. Voehl Jr.** has been named North East Area Sales Manager for the Cerro CATV Cable Division of Cerro Wire & Cable....**Leo L. Larkin, Jr.** has joined Anixter-Pruzan as CATV sales representative for the Pacific Southwest....**Leon Robitzsch** has been named CATV underground Division Manager for Burnup & Sims Inc....**Darrell Wells** has joined Anaconda Electronics as customer service representative at Anaheim. Also new at Anaconda Electronics is **Joe Dolan**, product salesman based in Matawan, N.J. and **Kirk Hollingsworth**, National Sales Manager, Anaheim.

**Frank Drendel**, formerly general manager, has been named President of Comm/Scope Company....**Warner Cable Corp.** has announced the appointment of **Leslie J. Rosenthal** as manager, public relations....**Stanford G. Cook** has joined C-COR Electronics, Inc., as Manager of Manufacturing Engineering and **David M. Silverman** has been appointed Senior Staff Engineer.... Anaconda has promoted **Bud Cradic**, assistant manufacturing manager, **Lew Wimer**, production manager and **Bob Yates** supervisor of production test.

General Cable Corporation (NYSE) announced that **Donald L. Nivling** has been elected a corporate vice president and **Raymond J. Birkholz** has been named general manager of General Cable Corporation's Apparatus Division....**Douglas E. Proctor** has been elected President, Cablewave Systems Inc.

## bookreview

The IEEE Standard Graphic Symbols for Logic Diagram is now available.

This standard, approved by the Department of Defense, the American National Standards Institute, and the Institute of Electrical and Electronics Engineers, is in substantial agreement with international standards (International Electrotechnical Commission Binary Logic Element Symbols-117-15) and incorporates a number of new symbols that are presently in process of achieving international acceptance. Internationally recognized uniform shape symbols are adopted in this newly revised standard: however, a substantial number of the distinctive shapes that were included in earlier U.S. standards have been retained.

The standard contains 64 pages and is \$6.00, postpaid. It may be ordered from the IEEE Standards Office, 345 East 47th St., New York, N.Y. 10017 or the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

BROADCAST ENGINEERING

# "Hands on" Educational FM

By Charles Wilson  
Lubbock, Texas, KLS-D-FM.

Students of the Monterey High School electronics department are nearing completion of a three-year project in "hands on" education. As a part of their class activity in vocational electronics they decided to form an organization to:

1. Investigate the legal aspects of constructing a 10 Watt Class D educational FM Radio Station.
2. Prepare and submit to the FCC an application for a construction permit for same.
3. Secure and refurbish old, out-of-date and defective commercial grade broadcast radio equipment.
4. Prepare a course of study that would dovetail into the vocational electronics curriculum for securing commercial radiotelephone operators' licenses.
5. Provide actual "hands on" experience for those students involved in the fields of management, technical operation, and functional operation.

The primary objective was to involve the student with local industry, technical problems, legal aspects of operation and provide public service for the community. As spin-off, it was expected that the project would increase awareness of the community in the efforts of the public schools to educate their children and inform the public about the good things that young people are doing now. With such a positive attitude, success was insured.

## Industry Help

Local industry proved to be the most responsive to the needs of the projects. Many of the local broadcast stations, in typical technician packrat fashion, had stored retired or obsolete equipment in the hope that it might someday prove useful. A committee of students was organized to exploit this resource.

The results of this "scrounging" committee were astounding. Enough equipment was obtained in this manner to enable the construc-

tion of the basic facilities. Two 10 x 10 studios were constructed using materials donated by local building contractors. The studios feature lift-out acoustical tile ceiling, carpeted floors, sound insulated walls, recessed fluorescent lighting, and paneled walls. The design and color scheme is attractive and efficient.

## Audio From Scratch

Audio portions of the studios' construction were then referred to the studio facilities committee which outlined to the construction team the requirements for a good, flexible console design. It was decided to construct two audio consoles; one of which was to become the main program console utilizing stereo in all inputs.

A minimum of eight inputs was necessary. Both record and playback modes were to be designed, along with the broadcast capability. This was to facilitate the use of the console as a production facility. Capabilities of the console included:

1. Cue and program—audition for each input.
2. Inputs from
  - a. Reel-to-reel tape recorder
  - b. Stereo microphone-console
  - c. 8 track cartridge deck
  - d. Cassette deck
  - e. Phone patch

- f. Two-stereo turntables
  - g. Auxiliary or general purpose input
3. Play-record inputs and outputs for using the console in the production mode.
  4. All integrated circuit construction using 709, 741, and 1 Watt audio amp modules.

In order to develop this final version of the console it was decided to construct the second console first and allow it to undergo the evolution necessary to produce a good workable system. The second console was to be a monaural news production console employing four inputs for one tape deck, phone patch, console microphone and one turntable. This console underwent three stages of evolution prior to acceptance of the final design of the mixer and switching network as a prototype for the main console.

In the first stage discrete transistor preamps were designed and compensated for the various equalization curves necessary for the appropriate audio sources. These proved to be unreliable, noisy and generally a maintenance headache. The second stage came with the use of active equalization circuits to improve upon the frequency response and signal-to-noise characteristics of the individual mixer

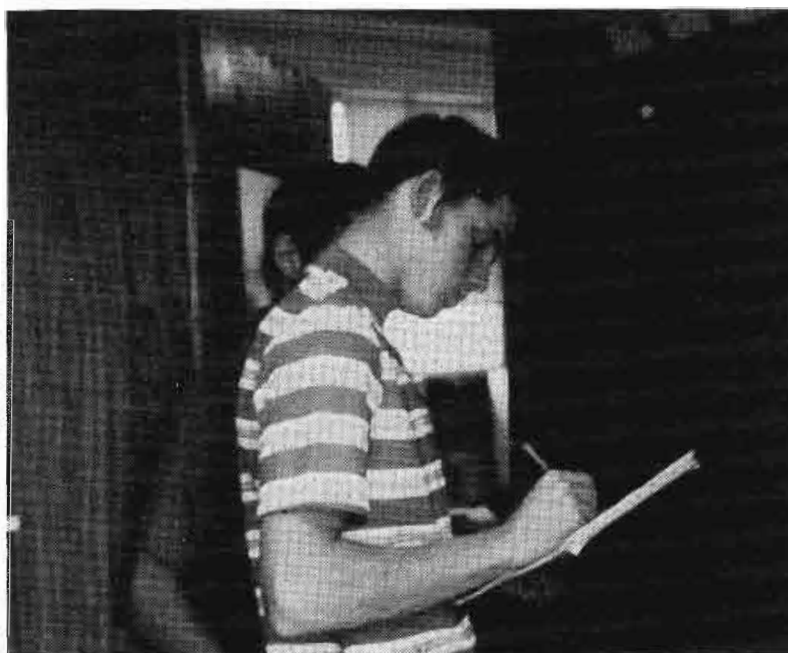


Fig. 1 First entry in the log for test readings on the new transmitter is made by a student engineer.

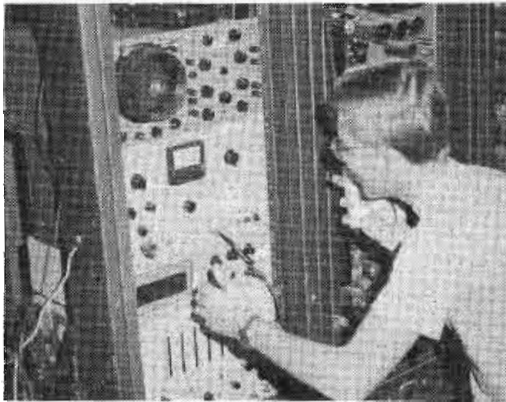


Fig. 2 Student engineer here is shown calibrating a counter prior to making frequency measurement.

input. The final prototype used active equalization networks, low Z inputs and outputs obtained by the use of single transistor impedance changing amplifiers, integrated circuit operational amplifiers as mixer preamps, active adjustable pre-emphasis network on the output of the console prior to compression and limiting.

The second console was subjected to rigorous frequency response, distortion measurements, and opera-

tional measurements which fell within acceptable parameters. The committee then accepted the prototype design.

Construction of the main console utilizing the best features of the prototype was begun and proceeded with little difficulty. Once we felt sure we had developed the capability, the construction permit committee proceeded with the application and performed the necessary surveys, made the radiation plots, designed the antenna system and submitted the application to the FCC.

The application was accepted by the FCC and a construction permit was issued to construct a 10 Watt Class D, non-commercial, educational FM Radio Station to operate on a frequency of 91.1 MHz.

#### Getting Approval

School board approval was needed for this application, so the students went before the school board and presented their proposal. The school board, though skeptical

#### Management Highlights

Helping a neophyte school station makes sense. It helps the kids, your community image, and it may have some further connection to our future.

at first, approved the proposal unanimously after the presentation. The FCC issued the CP on February 18, 1972.

The transmitter and transmitter monitoring facilities were the next step. The students managed to obtain a REL 549/DL 250 Watt FM transmitter built in 1947 from radio stations KLLL FM. The transmitter was then put into service by modifying it for 10 Watt operation.

A proof of performance test was then made on the entire system which established the data to ob-

## Don't let clipping penalize your broadcast program format

Whatever your program format, hard rock to classical — Our new Modulimiter model BL-40 Broadcast Limiter can maximize your transmitter power and extend coverage. It provides for independent adjustment of RMS compression and peak limiting *without clipping*. Symmetrical or asymmetrical limiting as you wish. Output level can be matched to any transmitter input. Modulimiter has low noise, low distortion, integrated circuitry and a test switch for proof-of-performance.

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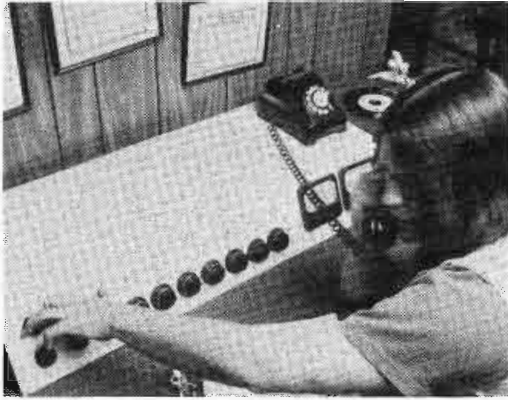
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**Fig. 3** Here is the completed 8-channel stereo console. Measurements indicate a 60dB gain with less than .1% distortion at 1kHz.

tain approval of the modification from the FCC. The modification was approved and program tests commenced. Antenna construction was performed after granting of the initial CP. A 120-foot guyed tower was installed by the students, transmission line installed, and 37M-1 antenna installed, McMartin TB 3000A and TB 3500 frequency and modulation monitors were installed to complete the system.

#### **Small Scale Pro**

Although the station has only a 10 Watt ERP, it embodies all of the features of larger stations in the form of engineering, production and programming. Management and business practices are taught. The individual students perform, on a job rotation basis, all of the duties of the various personnel involved in radio station operation. They are rotated through the various positions in the station in addition to their theory and lab in basic electronics. Presently, the station operates from 0730 CST to 1600 CST with a full schedule of entertainment, educational programming, and school news production.

The total cost of this project to the school system was less than \$100 which serves to emphasize the interest and help given by the local broadcast industry.

#### **Program Material**

Records and tapes became the next item to be approached. Local sources attempted to provide program material for the musical portion of the programming, but it was found that the station could

not maintain current music service in this manner. The station and local sources had neither the resources nor the time to provide really complete recording services. Therefore, all of the major record producers were contacted to secure promotional copies of the current music.

The station management found that in order to secure this service it would be necessary to publish a survey list of the most played and most popular songs each week. With the publication and distribution of this list, promotional record service began.

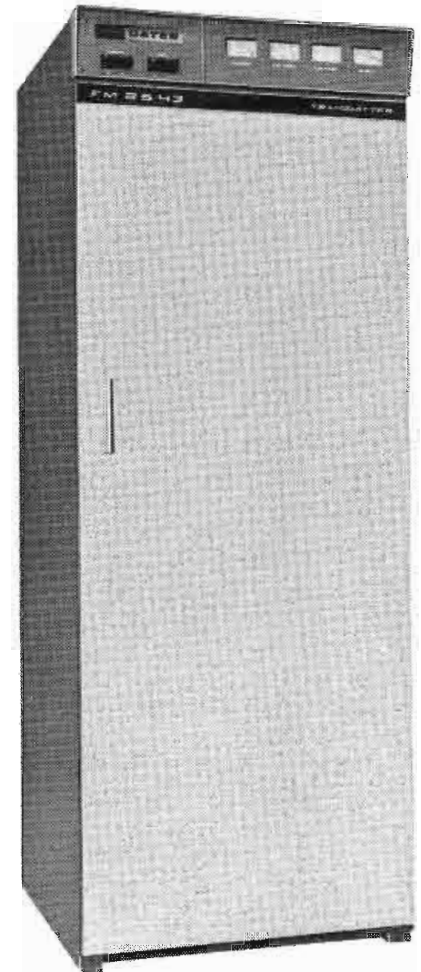
As far as we know, this station is the only one of its kind in the state of Texas that was conceived, designed, built, operated, programmed, and maintained by high school students, at no cost to the school system. It has proven itself to be a pattern-maker.

At the present time two other "hands on" projects patterned after the FM radio station are now underway. A complete closed-circuit TV facility (lacking a VTR) is now complete. A Burroughs L1500 computer system is in the process of being completed. Aside from the obvious technical benefits, the students have learned that by working within the rules of the school, city, state, and federal systems, positive change can be effected. Further they found that people in business were willing to go to great lengths to help young people help themselves to establish a better, more useful life for themselves through broadcasting.

**Editor's Note: Well, several congratulations are in order here. And why? You need to jog your memory and ask how you got into this business. Someone was willing to help.**

**And if you are like most of us, that help came at a tender age. So, some things never change. Boys are still intrigued by electronics and communications, and school stations are still being built. The word of thanks goes to those in the business who stop to help. After all, that still seems to be the way we will add new blood to an old profession.**

**If you operate an FM station with 3,000 watts E.R.P., there's one transmitter that's best for you.**



### **The Gates FM-2.5H3**

Unsurpassed for exceptional mono and stereo transmission, this two-tube, 2,500-watt transmitter features . . .

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- Stable, easy output tuning.
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- Remote control capability.
- Plug-in stereo and SCA generators.
- Gates-designed harmonic filter.
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For More Details Circle (34) on Reply Card

# NEW PRODUCTS

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

## Color TV Monitors

The **Conrac** vector output module for the 5000 Series color television monitor is now available.

The module, in conjunction with an external x-y oscilloscope, indicates visually the vector relationship of the chrominance signal. The module can be factory installed at the time of purchase or easily adapted at a later date simply with the use of a field conversion kit. It is available in versions for NTSC, PAL B or PAL M standards. Price is \$90.00 per kit.

The 500 Series is a new, small screen monitor which avoids the compromises of converted receivers, yet sells at a competitive price. It features a single gun CRT to simplify convergence adjustments and speed monitor setup.

For More Details Circle (62) on Reply Card

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For More Details Circle (35) on Reply Card

## Superimposed Data Off-Line Editing

**Time and Frequency Technology, Inc.** recently introduced the Model 739 Numeric Video Character Generator; a broadcast-quality instrument providing the capability of superimposing (non-additively mixing) any compatible BCD coded time information onto a video signal.

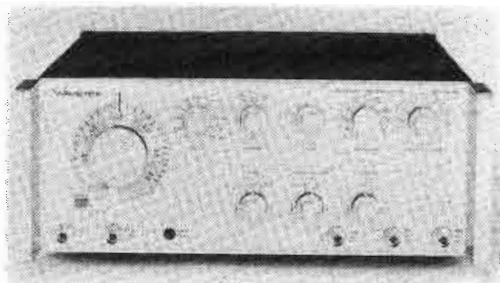
A popular application of the Model 739 is in off-line, time-code editing of video tape. Whenever SMPTE time-code editing is used, the Model 739 allows video tape from a quadraplex VTR to be edited on a lower cost, more versatile helical VTR.

Both six and eight-digit time formats can be accommodated by the Model 739; two digits each for hours, minutes and seconds plus an additional two digits, if desired, for tenths and hundredths of a second or for video frame information. Controls are provided for adjusting the appearance and position of the 7-bar-segment numerals on the television screen. Varying video input levels can be accepted and remote programming of character insertion is provided.

For More Details Circle (63) on Reply Card

### 30 MHz Function Generator

Wavetek announces availability of a 30 MHz function generator. This advanced generator also adds a new trapezoidal waveform which features



variable width and slope controls; therefore, pulses may be generated with variable rise/fall times. This new capability is in addition to the symmetry control which produces fixed

rise/fall pulses and sawtooth waveforms.

In addition to continuous operation, the generator may be triggered or gated for single cycle or tone burst output by an external voltage or manual trigger. Phase of the starting and stopping points of the triggered waveform may be varied  $\pm 90^\circ$  thus providing waveforms such as a haversine.

Additional features include precision 60 dB attenuator in 10 dB steps, variable DC offset, DC voltage output, and Wavetek's VCG circuitry for modulating the output frequency with an AC or DC signal.

For More Details Circle (64) on Reply Card

### Instrumentation Recording System

Ampex Corporation has announced the development of the MINISCAN instrumentation tape recording system which uses a tiny video recorder - weighing only five pounds - designed for analog, digital, radar and television recording applications.

Jerome Raffel, vice president-

manager of Ampex's instrumentation division, said the first MINISCAN systems, the MS-1 acquisition recorder and the MX-1 data reduction unit, will be ready for delivery early in 1974.

The MS-1 recorder uses one-inch tape and a helical scan wrap to achieve a 20-minute recording time (More...)

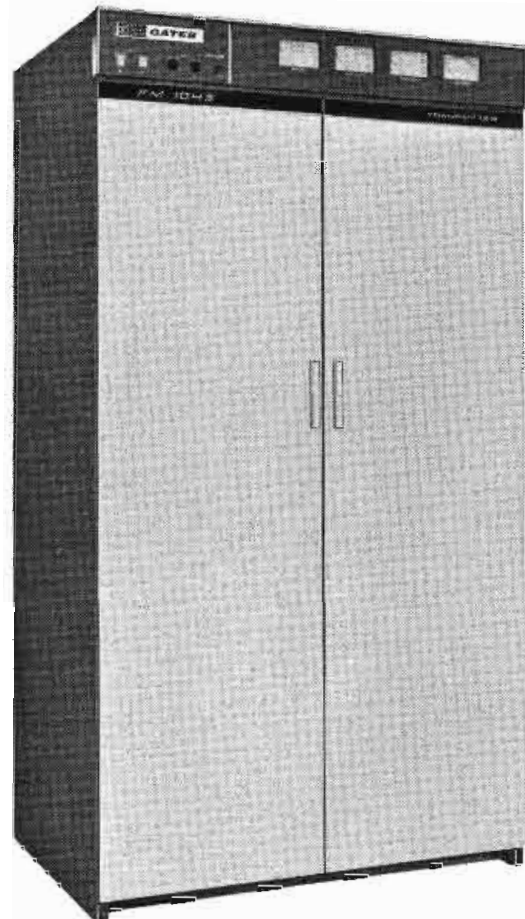


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if you think that heart disease and stroke hit only the other fellow's family.

**GIVE ... so more will live  
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FM station with  
50,000 watts E.R.P.,  
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transmitter that's  
best for you.**



### The Gates FM-10H3

Designed for exceptional fidelity and maximum reliability, this 10,000-watt transmitter features...

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- Automatic recycling.
- Motor driven output control. (Automatic output power control optional.)
- Plug-in stereo and SCA generators.
- Gates solid-state TE-3 exciter that's unsurpassed for stability and fidelity.

Plus a lot more that makes the FM-10H3 the finest transmitter available for Class B FM stations. Write for more information.

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# NEW PRODUCTS

capability.

The miniature recorder requires only 40 Watts of power and can be operated by a nickel cadmium battery pack designed to attach to the base of the recorder. Total weight of the MS-1 with battery pack is eight pounds.

The MS-1 is easily hand-held and measures less than one-tenth of one cubic foot (.1 cu. ft. vol.). Bandwidth is 3.5 MHz and dynamic range is 32 dB.

The tiny recorder accepts signals from any analog or digital input device, including television cameras, infrared sensors or radar systems.

The MX-1 laboratory playback recorder uses four specially designed servo systems. The playback recorder has a field-tested 100 nano-seconds peak to peak time-base-error.

As an analog recording system, MINISCAN provides totally transient-free record/playback operation. There is no restriction in input data format.

The system has a field tested capacity of five megabits per second without special encoder or data processing

techniques when used as a digital recorder.

For More Details Circle (65) on Reply Card

## Oscilloscope

The Hickok Model 5310 is an economical oscilloscope with bandwidth from DC to 10 MHz, AC or DC coupled. Using digital trigger circuitry, the Model 5310 offers stable triggering to 15 MHz. Vertical ranges are from 10 millivolts/cm to 50 Volts/cm in 12 calibrated ranges. Accuracy is +3%. An uncalibrated continuously variable control increases sensitivity to 5 millivolts/cm.

Sweep ranges are from 0.5 micro-second/cm to 0.2 second/cm in 18 calibrated steps. Linearity is better than 1% through full horizontal sweep.

The 5310 Oscilloscope has a 8 x 10 cm display. A 2.5-kilovolt accelerating potential and P31 phosphor produce a clear, high contrast trace.

By offering many high performance features, the Model 5310 is designed for all-around industrial, laboratory and service use. All controls for vertical, horizontal, time base, triggering and display are grouped together and color coded for convenient and simple

operation. Linear potentiometers are used to position the display. With the beam finder and auto mode, the signals can be located and positioned for viewing quickly.

For More Details Circle (78) on Reply Card

## Low-Cost Multimeter

Dana Laboratories, of Irvine, California, has introduced the Model 5900, described by the company as "the world's most accurate and stable five-digit multimeter."

The 5900 maintains + (0.001% of full scale) accuracy on the 10 Volt range for 24 hours, and + (0.001% of reading + 0.001% of full scale) for 90 days and over a 10°C. temperature span.

Accuracy is further enhanced by the input impedance capability to prevent less than 0.001% loading error from up to a 100 kilohm source.

To give the fullest practical potential from the dual slope integrator design, a 200-count delay has been inserted between the signal integration period and the reference integration period. This results in extremely high linearity, coupled with a bandwidth limited null detector with low noise characteristics. In addition, the integrator incorporates automatic zeroing circuitry to further assure 0.001% accuracy.

For More Details Circle (79) on Reply Card

## Video Head-Tape Rewinder

Ultra Audio Products has introduced a rewriter for EIAJ video tapes that eliminates the serious problem of headwear, tape damage and picture dropouts resulting from abrasion caused during tape rewind when it scrapes against all heads on a helical-scan video tape recorder.

The "AutoWinder" not only solves this problem and prolongs head and tape life, but saves time by rewinding an hour's tape in about a minute, with automatic slowdown and shutoff at tape's end. Its smoother wind also minimizes tape edge-damage. R-1 will rewind 1/4" and 1/2" audio tapes, too.

For More Details Circle (66) on Reply Card

## Time Announcer Controller

SMC has introduced their new Model 781 Time Announcer Controller. The power supply on this new unit is internal.

The 781 works from a digital 60 Hz counter and cycles any two audio sources between odd and even minutes. Controls permit the stopping

**Multisync**

"I wouldn't be without it!" —  
Jack McCoy, Program Director at KCBQ Radio in San Diego uses his Multisync. Multisync gives continuously variable speed control of tape decks and turntables.

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of the counter for setting the cycling to allow accurate time announcements.

Front panel display lights indicate which audio device is ready to play—either odd or even. The 781 has advance or stop control switches for the proper setting of the audio devices. Two separate types of start are available—a one-shot logic ground-going signal and a relay closure.

The unit has two audio inputs and one audio output. All major integrated circuits and circuit boards are plug-in. Audio is completely isolated via LDR devices. All connectors are first quality Amphenol. A front-mounted headphone jack is included for audio monitoring.

The 781 can, for example, handle two reel-to-reel and two cart playback machines. This new time announcer will function equally well with any type audio source. It fits in a 19" standard rack using 3" vertical space and 12" deep. The new 781 Time Announcer Controller is a direct replacement for the earlier SMC Model 581 Time Announcer.

For More Details Circle (67) on Reply Card

### High Speed Helical VT Contact Printers

Two new high speed helical video tape contact printers which do not require special mastering recorders or mirror-image master tapes have been introduced by **3M Company**.

The reel-to-reel model of the 3M Video Tape Contact Printer operates at a speed of 75 inches-per-second and may be field converted to handle various widths up to 1-inch. A second unit is designed specifically for in-cassette duplication of 3/4-inch U-Matic videocassettes at 37½ ips.

3M refers to the process used in its printers as the "STAM" method — for sequential thermal anhyseretic magnetization — because it combines the advantages of both thermal and anhyseretic stimulation for transfer of the video information.

The heart of the system is a special continuous metal belt coated with proprietary magnetic materials. Through thermal stimulation, the belt "picks up" the image from the master and, in effect, becomes a mirror image master. Magnetic stimulation is used to transfer this image from the belt to the copy tape.

While any type of tape may be used as a copy tape with the 3M system, the company recommends that CrO<sub>2</sub> tapes not be used as master tapes because of a tendency to erase when heated.

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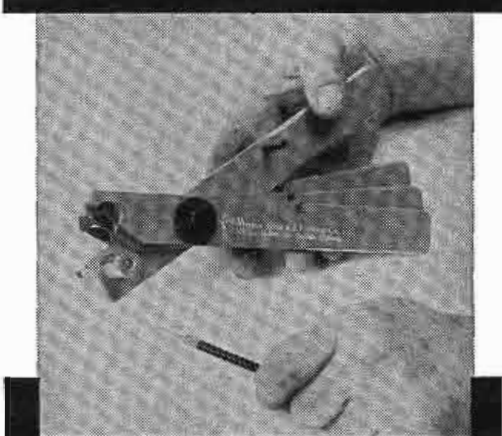
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Developed and used by NASA ■ Prepares cable for connectors in 10 seconds ■ Adjusts for stripping requirements of all standard co-ax connectors ■ Close-tolerance adjustment prevents nicked conductors ■ With removable inserts, accepts cable from .075" to .435" OD.

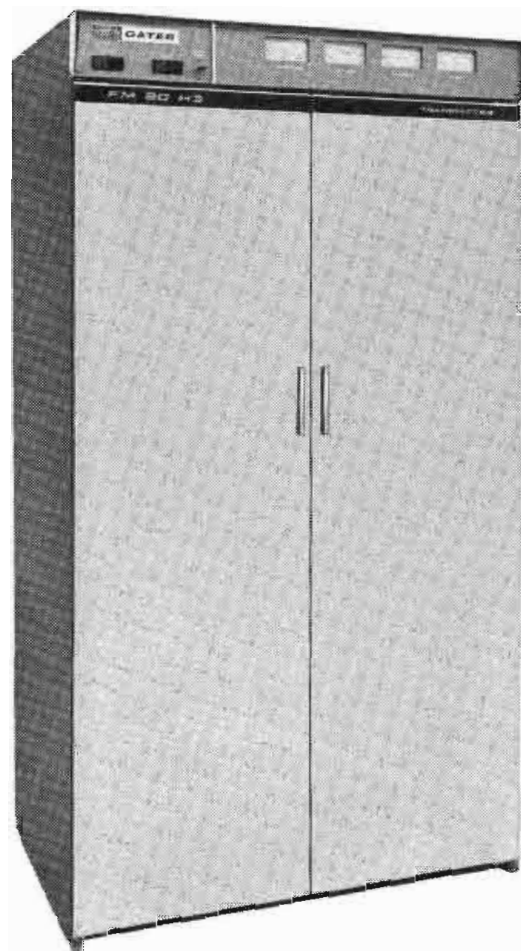
**PRICE \$44.50 F.O.B. San Clemente**  
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If you operate an FM station with 100,000 watts E.R.P., there's one transmitter that's best for you.



### The Gates FM-20H3

Designed for maximum efficiency and minimum operating cost, this three-tube, 20,000-watt transmitter features . . .

- Highly efficient amplifier circuits and conservatively-rated components for economy.
- Dependable Gates "Vari-Line" silver-plated tank.
- HV silicon power supplies.
- Automatic recycling.
- Full metering.
- Motor-driven output control. (Automatic output power control optional.)
- Plug-in stereo and SCA generators.
- Gates solid-state TE-3 exciter that's unsurpassed for fidelity and stability.

And a lot more that makes the FM-20H3 the finest transmitter available for Class C FM stations. Write for more information.

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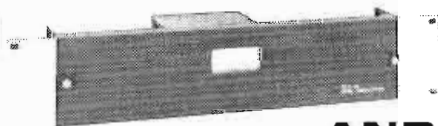


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## Program/Line Amplifier



## AND Monitor Amplifier

Stack the new Spotmaster amplifier twins in just 7" of rack space for troublefree wideband performance.

Model PLA-20 (shown here) serves as either a program or line amplifier. Input and output level are adjustable; gain is 60 dB, and maximum output is +20 dBm RMS.

Model MA-10 is a 10 watt (RMS) monitor amplifier designed to meet the most critical studio requirements. Gain is adjustable, frequency response is 30-20,000 Hz ( $\pm 1$  dB) and distortion is less than 1% at the rated output.

More details? Contact us today.

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A Filmways Company

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For More Details Circle (58) on Reply Card

## NEW PRODUCTS

### Wide Range Frequency Counter

A midget, crystal-controlled frequency counter, Model 151A is the latest offering from **Monsanto**, manufacturers of digital electronic instrumentation.

Capable of measurements from 5 Hz to 220 MHz, this new counter provides display storage as a standard feature with a memory circuit that will hold the prior count while a new one is being made. A seven digit, long-life LED display is used with a built-in self check, boasting a half-life reliability of 100 years.

Equipped with two inputs, selectable by a DC switch on the sensitivity pot mounted on the front panel, the Model 151A measures from 5Hz to 20MHz on the low range and from 1MHz to 220MHz on the high range. Gate time choices of 100msec and 1 second are also available from a switch on the front panel which also positions the decimal point. Further convenience is provided by the unit's ability to operate from conventional AC power line voltage or from a DC supply without requiring any adjustments.

For More Details Circle (69) on Reply Card

### Portable Frequency Meter

A complete line of self-contained, highly accurate frequency meters, covering the range from 500 MHz to 12,400 MHz is now available, from **Power Waves, Inc.**

The rugged construction and over-size micrometer tuning make the units particularly suitable for fast, accurate, laboratory or field transmitter frequency measurements well within the FCC requirements. The passive devices operate on as little as 1 milliwatt, over a temperature range of 0°C to +50°C. Micrometer readings are correlated to frequency by a conversion chart individually calibrated for each instrument. The company's laboratory is available for periodic calibration to insure continual accuracy.

For More Details Circle (70) on Reply Card

### Microwave Sweep Generator

**Texscan Corporation**, Indianapolis, Indiana, announces the Model VS-340 Sweep/Signal Generator. The VS-340 covers the basic microwave communi-

cations frequency bands.

The unit covers 3.6GHz to 6.5GHz in two bands. The low band covers 3.6GHz to 4.3GHz and high band coverage of 5.825GHz to 6.525GHz.

A fine tuning calibration vernier provides accuracy of better than 350KHz at 5MHz marker intervals at all frequencies on both bands. A separate rate control is provided for each band.

Sweep width is variable from 0.5MHz to 700MHz with an RF output of +10 dBm into a 50 Ohm load.

Flatness of sweep is  $\pm 0.1$  dB over any 50MHz interval and  $\pm 0.5$  dB over the full frequency range. The VS-340 contains crystal controlled markers at 5.0, 50.0 and 100MHz with 0.005% accuracy.

For More Details Circle (71) on Reply Card

### Digital Counter

The CM50 is a completely solid state frequency counter.

Manufactured by **Analog Digital Research**, the CM50 will not only measure frequency, frequency ratio, single and multiple periods, but can also be used as an event totalizer. Sensitivity of the 1 megohm input is 50mV over the entire frequency range of 5Hz to 50 MHz. The input is fully overload protected, and equipped with a slide switch attenuator.

The six digit LED display is constructed using 7 segment display chips which incorporate on-board counter, quad latch, and decoder driver. These IC's allow an extremely compact design. Discrete LED's are used for units annunciation and overflow indication.

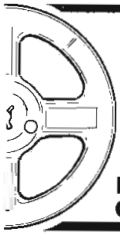
For More Details Circle (72) on Reply Card

### Portable Color Camera System

The **Asaca** portable color TV camera system ACC-5000 is a newly developed 3-tube portable color TV camera for broadcasting use. It is small, lightweight, fully mobile, highly reliable and will withstand the severest of operating conditions. Equipped with an automatic white-balance adjusting mechanism, this color camera system guarantees the best quality and delivers complete video signal outputs of the NTSC and PAL systems.

Through adoption of an adjustment-free and automatic mechanism, handling and operation of the camera have been simplified so that even novices can use it with ease.

This manual describes how to oper-



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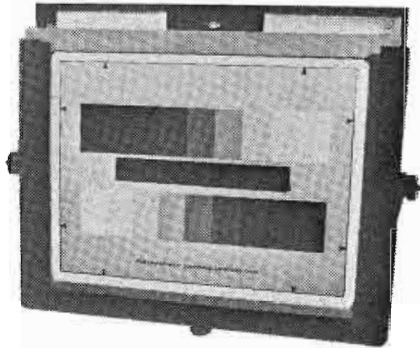
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October, 1973

ate the Asaka portable color TV camera system ACC-5000 in detail, and therefore, it is hoped that the user will read the following carefully to understand completely the proper use of the camera.

The camera head is designed for easy handling and operation. It is miniature in size, lightweight and mobile, suiting it to use in broadcasting, on-the-spot news coverage, interviewing and for use with video software.

Through adoption of an adjustment-free mechanism, color adjustment and operation have significantly simplified, and the set-up time has been shortened, so that even inexperienced operators can use it with ease.

The optical system is of unitized construction. The zoom lens and the iris can be servo-controlled, making operation very simple.

Automatic white balance adjustment is performed by simply pushing the Auto White switch.

Complete video signal outputs of the NTSC and PAL systems can be generated, and can be directly recorded on VTR.

For More Details Circle (73) on Reply Card

## Public Broadcast Authority

(Continued from page 35)

with improved lamps from a different vendor and we are now checking the life of these new lamps. It is too early to determine whether the life of the new lamps is better than the old lamps.

We also had one lamp fixture fail because a high voltage wire was not securely tightened on its terminal and arc damage resulted. Otherwise, reliability, is considered satisfactory. The strobe light installation on our Camden tower is also considered satisfactory. However, the installation has not been made long enough to form any definite conclusion. For the record, this installation has also been equipped with the new lamps and we have not had a failure since the installation.

In March 1973, the FAA requested comments by April 15, 1973 but extended to May 15, 1973, on their proposal toward strobe light installations on broadcast towers. NJPBA submitted the following comments:

(More...)



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Request Bulletin No.

BE 103

For More Details Circle (49) on Reply Card

1. that the daytime intensity was satisfactory.
2. that the nighttime intensity should be increased from 1,000 candellas to perhaps as much as 3,000 to 5,000 candellas,
3. that there seems to be a period of approximately one hour after sunrise and one hour before sunset where the daytime intensity is too bright and the nighttime intensity is too low.

We have suggested that a third intensity condition of at least 10,000 candellas be included to take care of these poor visibility conditions at sunrise and sunset.

Because we feel strongly that a third intensity condition be set up, we voluntarily run with our red lights as well as our strobe lights during the latter nighttime conditions.

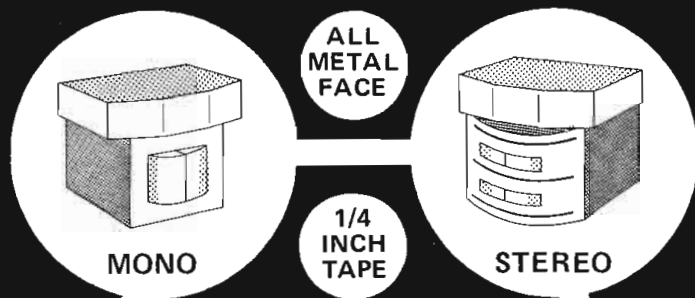
We have also commented that we are in favor of dropping tower painting requirement since we feel it does not contribute to aircraft safety when strobe lights are used.

One of the surprising features of

the strobe light installation is that we have received practically no adverse criticism from people living near the tower. We have received a half dozen complaints in the Trenton area, but no complaints at all concerning the Camden tower. The latter tower is located in a sparsely settled area in a state forest; whereas, the Trenton tower is located in a rather heavily built-up area.

By courtesy of the N.J. Division of Aeronautics, we have received favorable comments from pilots flying in these air corridors. They feel that the flashing white lights are a real help in navigation and they are generally satisfied with the additional safety.

As far as installation costs are concerned, each tower will have its own set of conditions. Therefore, no exact cost can be given in this article. Such variables, such as tower height, conduit availability, tower windloading design and power, all have a bearing on these costs. However, a \$12,000 per level figure is a good place to start. □



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## WANTED

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**NON-PROFIT, EDUCATIONAL MEDIA** corporation needs transmitting, production, and studio equipment for carrier current network, production facilities, and tentative FM station, Contact Free Media, Inc., Box 722 University Station, Lexington, Kentucky 40506 9-73-2t

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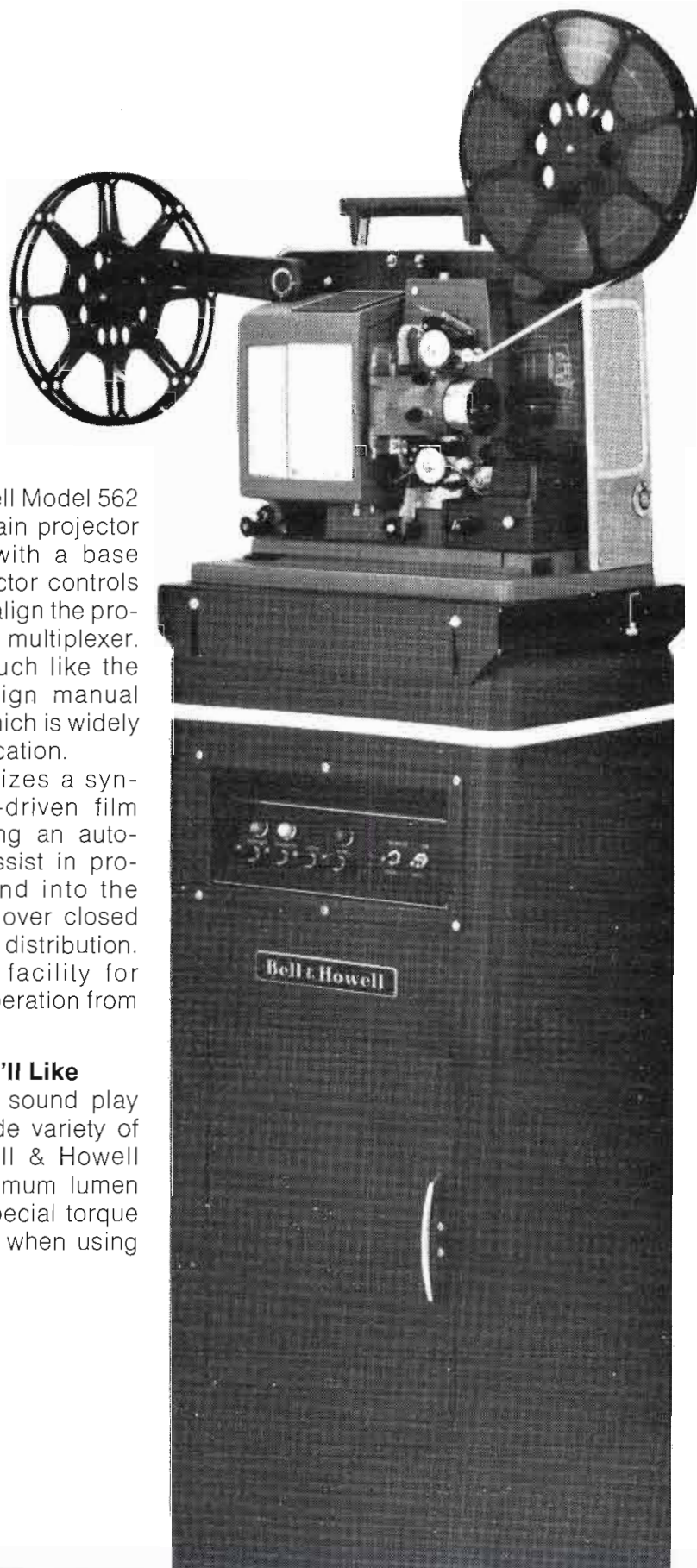
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# Filmchain Projection Simplified



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

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

#### Other Features You'll Like

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

#### Other Important Details

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

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

#### A Final Thought

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

AUDIO VISUAL PRODUCTS DIVISION  
7100 McCormick Road, Chicago, Illinois 60645



**BELL & HOWELL**

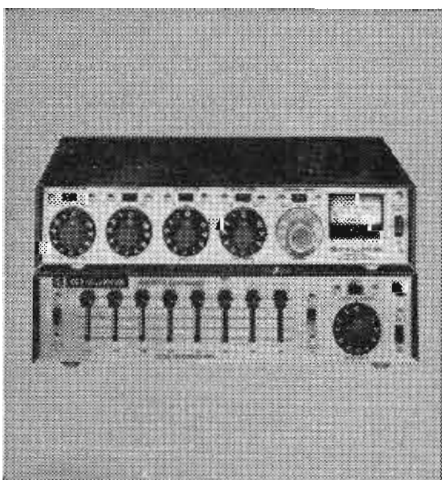
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\* More to come . . . other ingenious sound control centers will be discussed in future issues.

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