January, 1971/75 cents

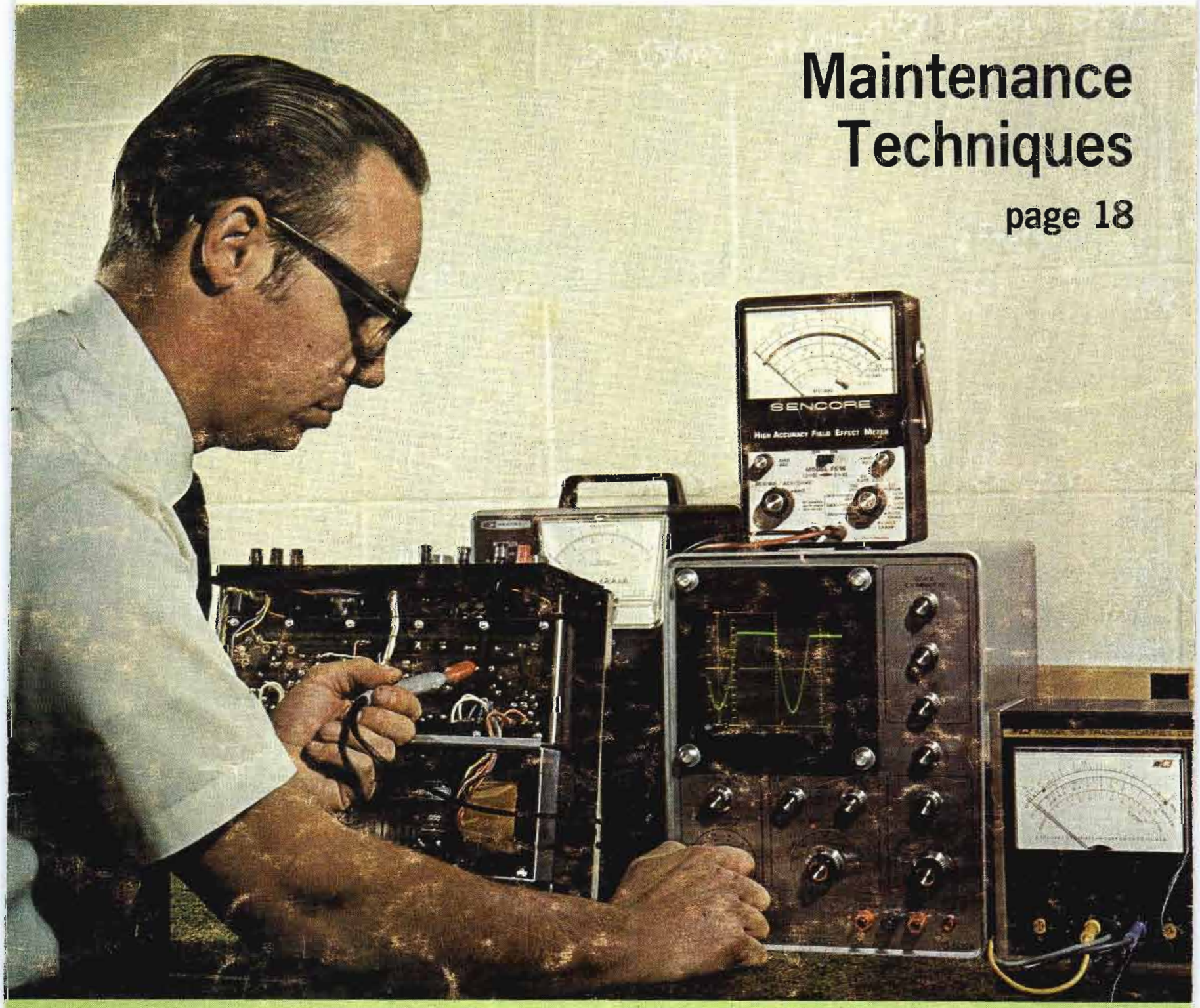
Broadcast Engineering®

the technical journal of the broadcast-communications industry

A HOWARD W. SAMS PUBLICATION

Maintenance Techniques

page 18



The Engineering-Management Gap

Network VIR Signals For Color

Emergency Power For Cable TV

The Year-'Round Lavalier

Around most TV stations, E-V lavaliers are taken pretty much for granted. Just hang one around your neck, or clip it onto lapel or pocket—and start talking.

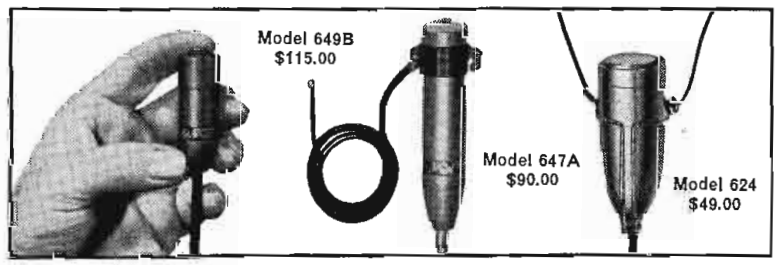
Nothing could make us happier. Because we take great pains to insure the absolute reliability of these tiny microphones. And frankly, no other type of microphone poses a bigger design problem. The lavalier gets dropped, stepped on, swung by its cord, smashed and banged—not once, but often during its life. Most of the abuse is accidental—but inevitable.

So we developed a "nesting" principle of construction that is based on tolerances so tight that the internal element acts as a solid mass, reducing damage due to shock. And we use nothing but Acoustalloy® diaphragms . . . almost indestructible despite heat, humidity, dirt, or high intensity noise or shock.

We've also spent years developing cable specifications—and methods for attaching it. We've taken into account all the tugs and twists that are the fate of any lavalier cable. That's why our strain relief is so effective. And knowing that no cable can last forever, we've made replacement easy and fast.

Of course reliability by itself is not enough. So our field testing of E-V lavaliers is also devoted to sound quality. We must satisfy major network and independent stations on every score. As a result, E-V lavaliers can be mixed in the same program with stand microphones with no change in voice quality.

In the process of developing the lavalier, we've also made it smaller. Our original model was 7″ long and 1″ in diameter. Today's Model 649B is just 2-1/4″ long, 3/4″ in diameter, and weighs a mere 31 grams!



Normal trade discounts apply to list prices shown.

Of course TV studios aren't the only places you'll find E-V lavaliers. They're used in classrooms, lecture halls, conferences, stages and business meetings. And they offer the same year-round reliability with no compromise of sound quality.

Every E-V professional lavalier is protected by our unique 2-year unconditional warranty against failure of any kind, plus the lifetime guarantee of workmanship and materials that is an integral part of every E-V microphone. Full details are waiting at your nearby Electro-Voice microphone headquarters. Or write us about your special needs. We're ready to solve the toughest sound problems—off the shelf—all year 'round!

high fidelity systems and speakers • tuners, amplifiers, receivers • public address loudspeakers • microphones • phono cartridges and stylii • aerospace and defense electronics

Electro-Voice®
A SUBSIDIARY OF GULTON INDUSTRIES, INC.

ELECTRO-VOICE, INC., Dept. 111V
638 Cecil Street, Buchanan, Michigan 49107

Circle Number 1 on Reader Reply Card

Look What You Miss When You Don't Comparison Shop

You miss the difference between production switchers incorporating only present-day engineering practices and THE ONE that gives advanced technical capability at a comparable price. Comparison shows that just one choice will put this advanced technology to work in your control room—Cohu's 9300 Series Production Video Switcher.

Start comparing. These standard features are the difference at Cohu:

DIGITAL LOGIC • State-of-the-art computer technology, permits automation expansion, simplified cabling

FULL COLOR TIMING • Even under all double reentry conditions, all output buses

TALLY TRANSFER • Full tally operation while rehearsing or taping off preset or preview channels

REDUNDANT POWER SUPPLIES Single failure will not interrupt programming

"TWO BUTTON" INHIBIT • Locks out accidental transitions

CUT BARS ON ALL BUS PAIRS • Including mix/insert and effects buses

AUTOMATIC FADE TO BLACK/FADE UP TRANSITIONS • Simplifies fades, eliminates errors

NONSYNCHRONOUS TRANSITIONS WITHOUT VISUAL PICTURE DISRUPTION Eliminates all nonsynchronous "hot cuts"

AUTOMATIC COMPOSITE / NON COMPOSITE SELECTION • No input mode selection required

There's even more. That's why we want you to comparison shop. To help, Cohu has published a comprehensive shopping guide explaining 26 key elements to consider during your switcher evaluation.

Copies are available from your nearest Cohu representative or by contacting the television product line manager direct at Box 623, San Diego, California 92112, TWX: 910-335-1244, Tele: 714-277-6700.

COHU ELECTRONICS, INC
SAN DIEGO DIVISION

Circle Number 4 on Reader Reply Card

January, 1971 ■ Volume 13, No. 1

Broadcast Engineering

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

Maintenance is the theme of this month's issue. With a changing technology it is important that both engineers and management understand the challenge and the responsibility. The cover picture is by Carl Babcoke.

DEPARTMENTS

ABP AIA BPA

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

BROADCAST ENGINEERING is mailed free to qualified persons engaged in commercial and educational radio and television broadcasting. Non-qualified subscriptions in the U.S. are $6.00 one year, $10.00 two years, $13.00 three years. Outside the USA add $1.00 per year for cover postage. Single copy rate 75 cents. Back issue rate $1.00. Adjustments necessitated by subscription termination at single copy rate.

Controlled Circulation postage paid at Indianapolis, Indiana.

Robert E. Hertel, Publisher

Intertec Publishing Corp.
Subsidiary of Howard W. Sams & Co., Inc.

HELICAL SCAN VTR PROCESSOR SYSTEM

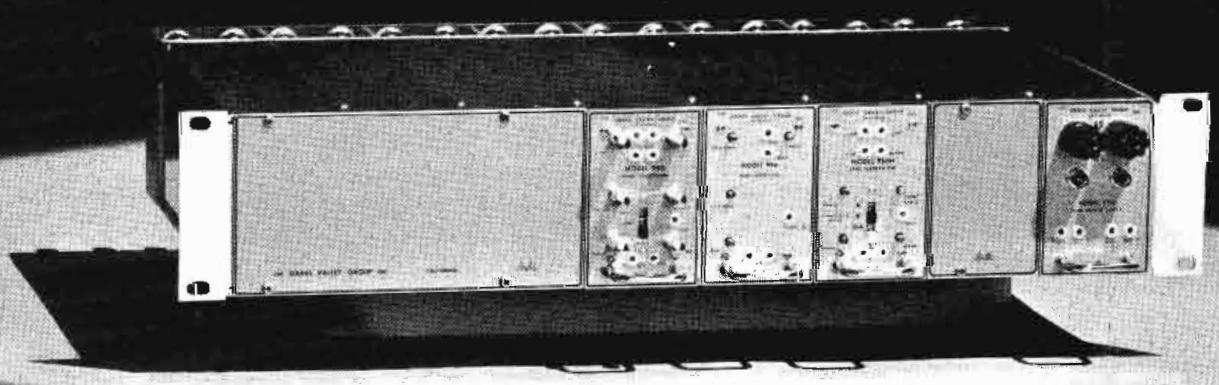
940H PROCESSING SYSTEMS RELIABLY REPLACE ALL SYNC AND BLANKING PULSES MISSING DURING THE PERIOD OF THE HELICAL SCAN (SLANT TRACK) VTR DROPOUT. BY INSERTING STANDARD PULSES INTO THE VIDEO SIGNAL, DUBS TO OTHER HELICAL SCAN OR QUADRUPLEX MACHINES CAN BE MADE. IN ADDITION, SYNCHRONIZING PULSES AVAILABLE FROM THE 950H SYNC GENERATOR CAN BE USED TO DRIVE CAMERAS AND SPECIAL EFFECTS SYSTEMS FOR TITLE INSERTION, ETC.

FOUR SYSTEMS ARE AVAILABLE, ONE FOR MONOCHROME AND THREE FOR COLOR. MODEL 940H-4 COLOR SYSTEM EMPLOYS A MODEL 955 COLOR LOCK AND COUNTER TO PROVIDE THE USER WITH A COMPLETE COLOR SYNC GENERATOR SYSTEM WHEN PROCESSING IS NOT REQUIRED.

ALL MODELS EMPLOY THE SAME TYPE MOUNTING FRAME. THE MONOCHROME VERSION (940H-1) CAN BE CONVERTED TO COLOR AT ANY TIME BY INSERTION OF A 955, 962, OR 966 MODULE.

MODEL 940H-1 (Monochrome)	$1,390
MODEL 940H-2 (Color w/Burst Amplifier)	$1,590
MODEL 940H-3 (Color w/Color Lock)	$1,830
MODEL 940H-4 (Color w/Complete Color Sync Gen)	*$2,065*
AGC OPTION (MODEL 906) FOR ANY SYSTEM	$500

GVG PROCESSORS CARRY A TWO YEAR WARRANTY AND ARE AVAILABLE ON A 30-DAY TRIAL.



THE GRASS VALLEY GROUP, INC.

FOR ADDITIONAL INFORMATION, CONTACT GRAVCO SALES, INC.

6515 Sunset Blvd.	Station Plaza East	1312 West Northwest Highway	2626 Mockingbird Lane	1644 Tullie Circle, N.E.
LOS ANGELES, CALIF.	GREAT NECK, N.Y.	ARLINGTON HEIGHTS, ILL.	DALLAS, TEXAS	ATLANTA, GEORGIA
(213) 462-6618	(516) 487-1311	(312) 394-1344	(214) 352-2475	(404) 634-0521

Circle Number 5 on Reader Reply Card

DIRECT CURRENT FROM D. C.

January, 1971

By Howard T. Head

VHF Television Remote Control Expected

The Commission is prepared to act (perhaps before these words are in print) to authorize the remote control of VHF television transmitters. UHF remote control has been authorized for some time.

The Commission's authorization for VHF television remote control operation comes in response to a petition by the National Association of Broadcasters (NAB). Extensive tests conducted by NAB demonstrated that remote control operation is feasible and does not result in any degradation of technical signal quality.

Commission approval for VHF remote control operation will be tied to improved off-the-air monitoring of signal quality and the availability of test equipment to permit adequate maintenance, especially of color transmissions. A "shakedown" period will be required as a condition for authorizing regular VHF remote control operation.

Commission Pushes Plans for Studying FM Interference To Television

The Commission is preparing to act in response to a request by a major television trade association for the formation of a special committee to study the problem of FM interference to television reception (see Nov., 1970 D.C.). This interference has been a problem for a number of years because of the close frequency separation between television Ch. 6 (82-88 MHz) and the FM broadcast band (88-108 MHz), the harmonic relationship between the FM band and television Chs. 7-13 (174-216 MHz), and frequency relationships involving the lower portion of the FM band and the television receiver local oscillator (see Dec., 70 D.C.).

The Commission was originally requested simply to form a Government-Industry committee to study the various aspects of these interference problems. However, the Commission is also seriously considering issuing formal proposals at the same time which would restrict the location of high-power FM transmitters in heavily populated areas, and which would require television receiver tuners to provide some rejection of the FM band.

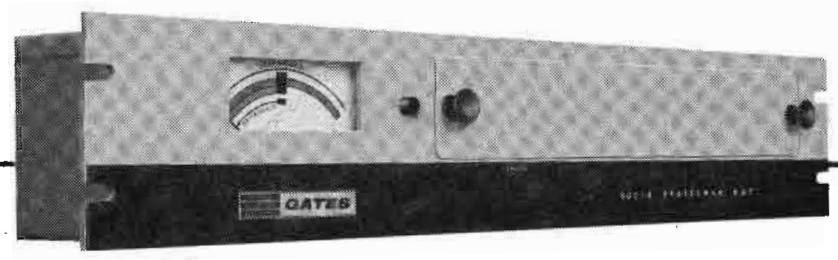
Also intimately involved in the problem are Commission proposals for the establishment of technical standards and a table of allocations for the non-commercial educational portion of the FM band (88-92 MHz), of particular interest to television licensees on Chs. 5, 6, 7, and 8.

(Continued on page 6)

For the finest in solid state amplifiers ...look and listen to Gates

AUTOMATIC GAIN CONTROL AMPLIFIER

The most flexible unit you can buy! Features include: Selective "fast, medium, slow" recovery times; a better than 30:1 compression ratio; up to 15 dB expansion; separate expansion and compression disable switches; separate input and output attenuators. All silicon solid state and field tested. Model No. 994-6629.

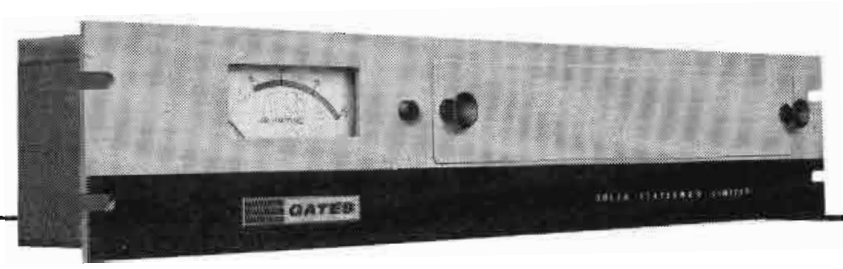


FM LIMITER

Instant peak control! Features include: 30 dB extended control range; fast attack time; low distortion; selectable "fast, medium, slow" recovery times; a higher than 30:1 compression ratio; separate input and output attenuators; readily accessible circuit components; unique dynamic recovery circuit. All silicon solid state and field tested. Model No. 994-6631.

AM PEAK LIMITER

Peak limiting without clipping! Features include: 3 to 5 micro-second attack time; 30:1 compression ratio allows 99.5% negative modulation without over-modulation; automatic phase reversal with asymmetrical limiting and positive peak modulation levels of 110% or 120% with negative peaks limited to 100%. Completely solid state and field tested. Model No. 994-6543.



For more information, write Gates Radio Company, Quincy, Illinois 62301.

HARRIS INTERTYPE CORPORATION

GATES
A DIVISION OF HARRIS-INTERTYPE

Circle Number 6 on Reader Reply Card

(Continued from page 4)

Standardized AM Directional Antenna Tolerance Proposal Ready for Adoption

The Commission is ready to adopt its proposal establishing standard methods of calculating directional antenna radiation patterns for new AM stations and establishing tolerance values (MEOV). The Commission's original proposal was reported in this column in December, 1965.

Using the new standardization methods, all new directional antenna patterns will be calculated assuming a one-ohm equivalent loss in series with the base of each tower of the directional antenna system, or in series with the current antinode for towers taller than one-quarter wavelength. Tolerance values (MEOV) are to be arrived at by applying a percentage tolerance of 5 percent to the calculated pattern, to which is to be added a quadrature term consisting of 3 percent of the RSS of the individual tower vectors.

Although the new method is presently intended only for new directional antenna patterns, it is the Commission's intention to apply the technique ultimately to all existing directional antennas. Before this can be done, however, agreement must be reached with the neighboring North American countries, especially Canada and Mexico.

NAB Proposes Revisions of FCC Rules

A special subcommittee of NAB's Engineering Advisory Committee has prepared a complete revision of subparts D, E, and F of Part 74 of the Commission's Rules. These portions of the rules deal with remote pickup, STL, intercity, and other auxiliary stations for both radio and television.

The proposed new rules reflect a complete revision of the present rules governing these classes of auxiliary service, the first time that such a wholesale rule revision has ever been proposed to the Commission. If these proposed revisions prove acceptable to the Commission, NAB is considering the possibility of similar proposals covering all the Commission's Broadcast Rules and Regulations.

Commission Encourages Non-Commercial Educational FM Broadcasting

The Commission has proposed to permit non-commercial educational FM radio stations to charge tuition fees for formal courses broadcast over these stations. This would be restricted to material broadcast using the FM subcarrier frequencies employing the standard FM multiplex system. In addition, the Commission has also invited comments on possible expansion of its Rules so as to permit the use of multiplex operation for a wider range of program material.

These proposals come at a time when the Corporation for Public Broadcasting (CPB) is making available large sums of money for the construction and operation of high-power "public" FM radio stations which is certain to stimulate the development of non-commercial FM radio broadcasting. In the absence of prompt action, however, these plans may be on a collision course with television reception unless the Commission's new FM/TV Advisory Committee proves able to function effectively.

DITCH WITCH FOR '71

Ditch Witch leads the way — again in 1971!
And 1971 brings a complete lineup of trenching equipment that's designed to make Ditch Witch the one for '71 in your construction picture.
There's a Ditch Witch trencher to fit your every trenching need — from compact, self-propelled handlebar models to rugged 60-HP units with main-line capabilities.
And now, new models incorporate proven Ditch Witch features with innovative designs to help you get ahead in '71 . . . to give you even greater value for your trenching dollar.
Don't take our word for it! Let us show you why Ditch Witch will lead the field again this year.
Your reply will bring complete information on any product in the line . . . your call will arrange a demonstration under the digging conditions of your choice.
Let us show you the professional approach to trenching . . . from Ditch Witch, '71!

. . . Years ahead to help you get ahead

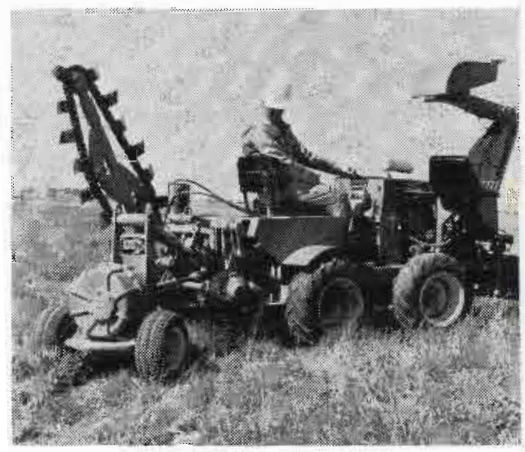
DITCH WITCH

The Professionals

CHARLES MACHINE WORKS, INC.

NEW R40: You'll find features on this new 37-HP Ditch Witch trencher that the competition can't match: selective front or rear power steering; choice of single or double auger or offset trenching attachments; a vibratory plow that mounts on the front or rear of unit. The R40 is big and powerful, yet it will out-maneuver many compacts. Other attachments are the new 140 Backhoe and the Roto Witch boring unit. Trenches up to 12" wide, 6' deep, capacities to 2,000 FPH.

NEW V30C "COMBO": This versatile new machine performs *five* separate digging operations, *without* changing attachments in the field. Revolutionary design lets you trench, backfill, backhoe, do vibratory plowing and horizontal boring operations — all from the same unit! Digging boom and plow are mounted on the rear; backhoe, backfill blade and boring unit are mounted on the front. Operator can instantly select machine function to fit the job requirements. It's new from Ditch Witch — and there's nothing like it!



NEW TRACK MOUNTS: Ditch Witch now offers two new track-mount trenchers—the V30 Track and the J20 Track. The only track mounts with variable hydraulic travel control independent of mechanically-selective digging chain speeds . . . plus a simple low-maintenance hydraulic system, friction disc brake steering, maximum engine cooling, wide 10" track pads and a full 10" ground clearance. J20 Track trenches to 12" wide, 5' deep; V30 Track trenches to 12" wide, 6' deep.

NEW VP12 VIBRATORY PLOW: The new self-contained vibratory plow for installing services without trenching! So compact it goes through any standard yard gate, plows to 150 FPM in good soil conditions. Installs lines, copper/plastic tubing or pipe without trenching, with minimum 12" cover. Turf damage is held to absolute minimum. A 25-HP air-cooled engine mechanically powers plow shaker box. The new VP12 is highly maneuverable, easily transportable, yet offers traditional Ditch Witch stability, even on hillsides.

NEW C-SERIES: So compact, it goes anywhere . . . so powerful, it delivers the lowest cost-per-foot trenching of anything in its class. This economy champion from Ditch Witch is fully self-propelled, with either 7- or 9-HP air-cooled engine. New, convenient controls for operator efficiency and safety. Self-locking depth screw locks digging boom in position — and the digging assembly is the same rugged type used on larger units. Trenches up to 6" wide, 2' deep, capacities to 400 FPH.

100 Ash Street, Perry, Oklahoma 73077

Circle Number 12 on Reader Reply Card

LETTERS TO THE EDITOR

The View From DC Restoration

Dear Editor

Reading your article in the October issue of Broadcast Engineering leads me to believe I can find in you someone receptive to a specific complaint I have against present practices in commercial broadcasting. Perhaps you can find time to write an article on the subject. My "letters-to-the-editor" have not germinated. A letter to Mr. Trevarthan of NBC elicited the reply that their monitoring methods were not at fault.

At one time there were DC restoration switches on monitors. Most of the home receivers do not have DC restoration. The home receivers, being without restoration, suffer from the high luminance level backgrounds being employed in many commercials. The subject matter in the foreground is thrown down in the black but personnel in studio control rooms see the DC restored version and do not seem aware of the deficient picture on the home receiver.

Elihu T. Brown
Rutherford, N.J.

We are sorry to disappoint Mr. Brown, but we have to agree with NBC that the correct monitoring method is via DC restored monitors. And regardless of how the picture monitor is setup, it is not the primary monitor of signal correctness —rather, this is the waveform monitor, where video excursions are kept between +7.5 and +100 IEEE units. The 7.5 units represents black or absence of light, a DC component. This is a basic component of the video information, and it can never be justifiably ignored. Regardless of how home receiver manufacturers chose to build their sets, it will never be correct to compensate receiver deficiencies by pre-distortion of the transmission signal.

What Mr. Brown in effect is proposing is a constant APL transmission system, which is in complete violation of current technical standards. The signal as it is transmitted has the correct gray scale and DC components. If "lowest common denominator" home receivers do not utilize this information, the problem is obviously not at the transmission point.

So while we agree with Mr. Brown that large APL variations do indeed upset luminance balance in unclamped displays, we suggest that he voice his complaints where they can do the most good—with the home receiver manufacturers. This particular problem is just one of many which add up to a less than optimum total transmission system, and we heartily encourage efforts towards improvement.

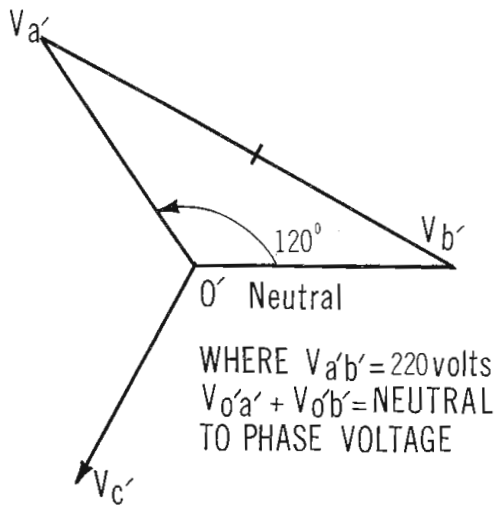
Walt Jung
ETV Editor

Lightning Protection Hits Sour Note

Dear Editor:

With regard to the interesting and informative article in your November issue of Broadcast Engineering concerning Lightning Damage to Power Supplies, I find Mr. Smith has made a slight error with regard to his 3 phase transformer configuration in Figure 1. Contrary to Mr. Smith's diagram, the voltage between the neutral point of A'B'C' and each of the phases is not one half the phase to phase value, but is instead the phase voltage divided by square-root of three. This is illustrated by the phasor diagram Figure A. As can be seen by the phasor diagram, one half of $V_{A'B'} = V_{A'O'} = V_{B'O'}$. The resulting voltage is 220/1.732 or approximately 127 volts which is considerably greater. Seemingly the only to circumvent the problem would be to tap one of the phases such that 110 volts appears between the tap and the neutral-ground.

Here on the West coast the above difficulty is avoided since utilities use a Y to Delta configuration, the Y being primary and Delta being secondary. Since the secondary is



Delta, by center tapping one of the legs 120 volts can be obtained which is one half of the phase to phase voltage of 240 volts. As was stated by Mr. Smith, the center-tapped transformer is usually considerably larger since it supplies both single and 3 phase loads.

Willard L. McVey,
Chief Engineer, KAFY
Bakersfield, Calif.

IC Info Needed

Dear Editor

In your October, 1970, edition of Broadcast Engineering, page 16, "Educational Broadcasting", you refer to an integrated circuit "LM371".

In an effort to experiment with these circuits we are looking for this IC but are having no luck in obtaining it. I am wondering whether you can be of some assistance in this matter? If you could supply us with the manufacturer's name, I think that we could possibly obtain it from our local distributor.

Any assistance given us in this matter will be greatly appreciated.

Ray Cullison
Chief Engineer
KTVS
Sterling, Colo.

For Ray Cullison and those other readers who may have missed our IC series on the LM371 and other devices (BE Sept., Oct., and Dec., 1969); the LM371 is available from

(Continued on page 10)

(Continued from page 9)

National Semiconductor Corporation. National has national distributors, some of which are Cramer Electronics, Hamilton-Electro, and Pioneer Standard.

Help Requested For Recorder Info

Dear Editor

I have a religious radio program on six different Mexican local radio stations. My equipment consists of a $91.00 Shure microphone, a Bogen MX6A Mixer and three semi-pro recorders. I need a full track tape recorder that is easy to operate. I am paralyzed and cannot use even my fingers.

Suggestions, literature and prices would be most appreciated.

Rev. Larry D. King
Box 924
Del Rio, Texas 78840

There's more to this one than meets the eye. Perhaps some of you out there have had enough experience with the problem to give the Reverend King some ideas. Why not drop him a line.

Technical Standards

Dear Editor:

Seldom do I ever take time to answer a published letter to the editor. In the July 1970 issue of **Broadcast Engineering** I read a letter from a chief engineer of a non-directional class IV station down in Tennessee.

It is obvious that the writer is not familiar with the problems of stations operating with a directional type antenna and is not at all familiar with the proposal that the NAB has before the Commission.

The NAB is not trying to lower the technical standards in any way, only update rules made nearly fifty years ago.

If Mr. Williams was at all familiar with the problem, I am sure he would agree that a "five-week-wonder" may have passed the First Class operators license test, however, this does not mean that he is competent to properly adjust a directional antenna or any of its associated equipment. On the contrary, it's more likely that these people create more of a problem when they tamper with equipment. Any manager of a directional station is only fooling himself when he allows the "five-week-wonder" to tamper with station operation. It makes more sense to have third class operators make routine meter readings and have a first class operator on call that really understands the directional antenna. I am sure the Commission would have far less technical violations if they adopt the NAB proposal.

Glenn F. Bircher
WINU
Highland, Ill.

Ground Wire Anyone?

Dear Editor:

I am wondering if any readers have removed old ground system copperwire from the ground? Last year we put up a new antenna in a new location, and would like to remove the 5 miles of copper ground wire. With the price of used copper at a high rate, there's real money laying there in the ground. Any ideas anyone?

Ray Bohnert, CE
WIGM & WIGM-FM
Lock Box 59
Medford, Wisc. 54451

INDUSTRY NEWS

NBC Code Is Cleared

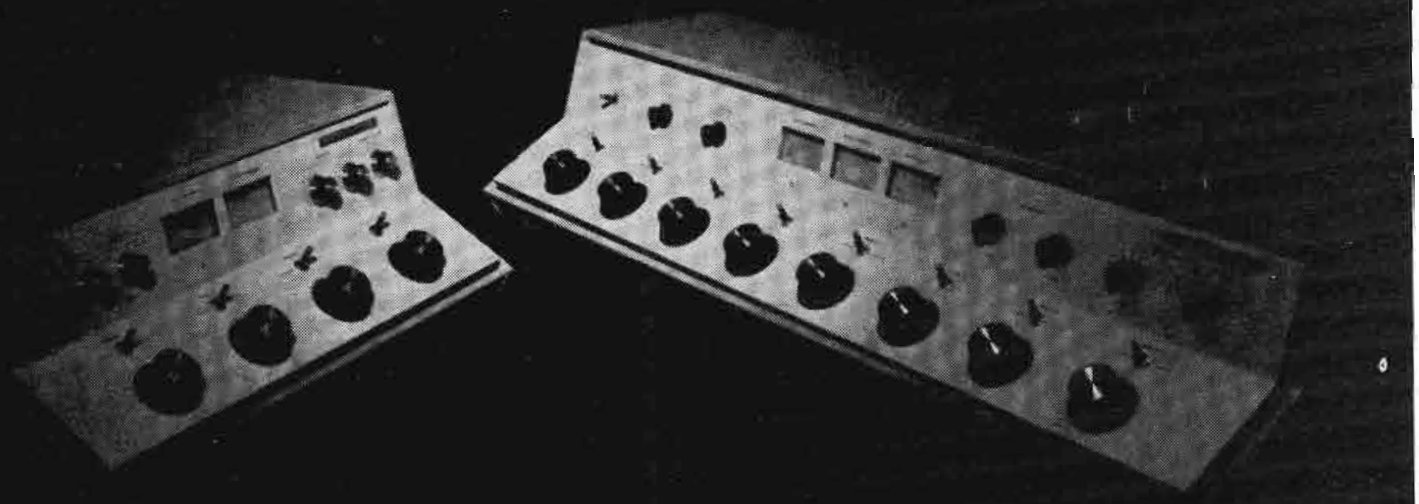
In response to a request from the National Broadcasting Company, Inc. (NBC) for permission to use a new cue signal to alert its network stations to prepare for local and commercial inserts, the FCC has informed the network that it will concur in the use of the proposed signal on a regular basis but that it would review and perhaps withdraw concurrence if later developments "make such a course advisable."

The new NBC signal would appear as a rectangular white block occupying the last ten microseconds of lines 21 through 23 in both fields of the transmitted picture. The signal would be flashed for about five seconds approximately one minute before the local commercial cut-away and would reappear as a steady signal for about five seconds just prior to the cut-away. The NBC signal would appear in the upper right hand corner of the transmitted picture and would occupy the same area used by one of the electronic identification signals permitted under the provisions of Section 73.682 (a) (22) of the rules.

Pointing out that its main concern is to insure that extraneous matter which would degrade service to the public is not included in a broadcast signal, the Commission said that while receivers presently available would not normally show this cue signal, it would be possible that receivers designed along current trends with lesser overscan might show the coded picture area. The Commission said that it had limited the duration of coded program identification transmissions to one second to insure that even if they were visible they would not be likely to be a source of program degradation to the viewer.

Noting that the new signal would not adversely affect broadcast service at the present time, the Commission said that if the five second cue becomes visible on an appreciable number of newer receivers its acceptability will become questionable and it is for "this reason that our concurrence is made subject to future review." The Commission said that while it recognizes that considerations of economy and simplicity may call for a signal system used to convey information from the network to its affiliates to be included in that portion of the signal that is broadcast to the public, "such considerations can justify transmissions of this nature only for so long as it appears that no degration of service to the public results."

You can do more



with Collins new stereo consoles

Increase your station's capability and programming flexibility by selecting Collins 4-channel 212K-1 or 8-channel 212L-1. Both are all new, all solid-state. And packed with features such as reverse cue and stereo headphone output jacks.

The 212L-1 has dual stereo monitor outputs and a monaural program output.

Both consoles have fresh new styling—easy to look at, comfortable to use.

And under this new look . . . Collins design and manufacturing quality.

For more information, see your Collins representative or contact
Collins Radio Company, Dept. 400, Dallas, Texas 75207.
Phone: (214) 235-7863 (direct line).

COLLINS

COMMUNICATION/COMPUTATION/CONTROL

Circle Number 10 on Reader Reply Card

(Continued from page 10)

NAB Changing Structure

The NAB has announced the formation of a committee to develop standards for cassette tape recorders in order to make them compatible for the transmission of broadcast material.

Ross H. Beville, Broadcast Electronics, Silver Spring, Md., committee chairman, said standardization is needed because cassette recorders "are an important technological advancement which show promise for the broadcasting industry." He said they should be standardized so that recorded material will be of broadcast quality and interchangeable among stations.

George W. Bartlett, NAB vice president for engineering, pointed out that NAB has adopted standards for disc and tape recordings and said these now are followed throughout the United States.

The committee will hold a meeting January 4, 1971 at NAB's Washington headquarters.

In addition to Beville, committee members are: Mark Weavers, 3M Company, Magnetic Products Division, St. Paul, Minn.; Byron E. Fincher, Product Management, RCA, Camden, N.J.; O. S. Paganuzzi, Broadcast Systems Engineering, NBC, N.Y.; Roy W. Pyburn, Ampex Corp., Redwood City, Calif.; W. J. Kabrick, Engineering, Gates Radio Co., Quincy, Ill., Dean W. Flygstad, The Telex Corp., Minneapolis, Minn.

Dick Turner, Sales Department, Telex Corp., Minneapolis, Minn.; Paul R. Bunker, Broadcast Equipment, Telex Corp., Minneapolis, Minn.; Richard D. Myers, Equipment Sales Corp., Marathon Broadcast Equipment Sales Co., West Boylston, Mass.; R Clifford Rogers, Phillips Broadcast Equipment Corp., Montvale, New Jersey; John Gable, System Engineer, ABC, New York, N. Y.; Fred L. Bailey, Sono-Mag Corp., Bloomington, Ill., Bernie Swandic, CBS Radio News, Washington, D.C.

Additional members will be announced later.

Operator Requirements

The National Association of Broadcasters asked the Federal Communications Commission to extend until Feb. 2, 1971, the date for filing comments regarding the relaxation of operator requirements for AM and FM radio stations.

NAB and its Engineering Advisory Committee has spent a number of years studying various approaches to amend these requirements so that they encompass the "latest technical developments, the present and future state-of-the-art, station practices industry manning requirements, job requirements and responsibility, and the impact of automation and mechanization."

The Association said the Committee should be given the opportunity to develop comments and "evaluate the far-reaching proposals" the Commission has made to relax operator requirements.

NAB said the extension is being requested because its Engineering Advisory Committee and the Association's Small Market Radio Committee, with which the Advisory Committee may need to consult, had not held meetings until January, 1971.

NAB To Expand Future Of Broadcasting Committee

The Executive Committee of the National Association of Broadcasters has voted to expand the membership and functions of NAB's Future of Broadcasting Committee and to assign it the role of supervising an "effective broadcaster liaison with government."

The decision was disclosed in a report to the NAB Board of Directors by Chairman Willard E. Walbridge, Capital Cities Broadcasting Corp., Houston, Tex., who also heads the seven-member NAB Executive Committee.

Walbridge said the Executive Committee found that the Future of Broadcasting Committee, under the chairmanship of Dale G. Moore, president of Western Broadcasting Co., Missoula, Mont., has done "an outstanding job" in establishing the foundation for a permanent legislative contact procedure in following through on its limited authorization to explain to Congress broadcasting's opposition to the unregulated competition from community antenna television systems.

Walbridge said the Executive Committee recognizes that there are many "other issues in addition to CATV which affect our free industry" and the Future of Broadcasting Committee should be reestablished on a broader concept for an "overview of all problems and issues that affect the future functioning of our industry."

He said NAB president Vince Wasilewski, with the Executive Committee's unanimous approval, appointed Hamilton Shea, chairman of the Television Board and executive vice president of the Gilmore Broadcasting Corp., Harrisonburg, Va., as chairman of the expanded Future of Broadcasting Committee.

It was further agreed that the former committee would continue to function as a subcommittee of the expanded group under the chairmanship of Moore and will continue handling legislative liaison on CATV affairs.

Make Plans Now For The 1971 NAB Convention In Chicago March 28-31

"I WARNED YOU ABOUT MESSING AROUND WITH THAT SATURATION KEY!"

PSA Requirements Affected By New Mexican Pact

Rule amendments to reflect new agreements with Mexico governing standard (AM) broadcast allocations and pre-sunrise operating privileges of AM stations in both countries have been adopted by the FCC. These agreements became effective on Novmber 18, 1970.

The new agreements and the amended rules relax operating restrictions in two important respects: some 250 U.S. Class II daytime stations assigned to the Mexican I-A clear channels 730, 800, 900, 1050, 1220, and 1570 kHz are, for the first time, eligible to apply for pre-sunrise service authorizations (PSA's) to operate between 6:00 a.m. local time and their licensed sunrise times. In addition, 26 U.S. Class IV stations located within 100 kilometers (62 miles) of the Mexican border are now eligible to apply for increases in daytime power to 1000 watts. Some of these Class IV proposals, however, will require co-ordination with Mexico to allow for simultaneous power increases by stations in both countries.

The permissible power for U.S. Class II pre-sunrise operations on Mexican I-A clear channels is authorized daytime power or 500 watts, whichever is less, or such lesser power as may be necessary to afford treaty protection (including protection under the 1967 U.S.-Canadian "Pre-sunrise" agreement) to foreign stations on the same channels. With respect to Mexican protection, the applicant must show that power will be reduced to the extent that both of the following requirements are met: (1) that a signal in excess of 25 uv/m 10 percent skywave will not be produced at any point on the dominant station's 0.5 mv/m 50 percent skywave contour falling on Mexican territory, and (2) that a signal in excess of 50 uv/m 10 percent skywave will not be produced at any point on the Mexican border or boundary where the dominant station's signal exceeds 0.5 0.5 mv/m 50 percent skywave in strength.

Lighting Convention Set

The Illuminating Engineering Society through its Theatre, Television and Film Lighting Committee will be sponsoring a World Colloquium at the Hotel Roosevelt in New York City, from May 23rd to 27th 1971.

During the last six years, the Theatre, Television and Film Lighting Committee has held an annual symposium in various parts of U.S. These have offered the opportunity for an exchange of information and ideas which have greatly contributed to a definition of standards and improvements in technology and techniques.

The World Colloquium will provide a long overdue forum for an international exchange of views. The keynote will be "the future',, and the theme "Lighting 2000".

The Colloquium Committee includes some of the top personalities in the Theatre, Television and Film Lighting fields from around the world, and is headed by Chairman Salvatore Bonsignore.

The program will include formal papers and technical demonstrations, emphasis will be placed upon round table and open discussions, with active participation by delegates on such subjects as Professional training, the impact of automation, the relationship of lighting design techniques and requirements to building architecture and the impact of new equipment.

In addition, there will be technical discussions on such specialized subjects as colorimetry, light sources and product needs and development.

The Papers Co-Chairmen are Peter Otto, of ABC Television, 1330 Avenue of the Americas, New York, New York, 10019, and Charles J. Neenan, L. K. Comstock & Co., Inc., 155 East 44th Street, New York City, and either will be pleased to hear from prospective authors and send them a prospectus governing the submission of papers.

Public Radio Gets Siemering As Director

Wililam H. Siemering, manager of one of the most innovative public radio stations in the country, has been appointed Director of Programming for National Public Radio, the new networking and program service of non-commercial radio. The announcement was made by NPR President Donald R. Quayle.

Siemering comes to NPR after eight years as manager of WBFO-FM of the State University of New York at Buffalo. During his tenure, WBFO established the first satellite studio devoted to program planned for and by the non-white community in Buffalo. In 1968, he received the Broadcast Preceptor Award from San Francisco State College for 'remarkable guidance in bringing a renaisance in radio at the State University of New York in Buffalo."

3M Develops Cold Weather Comm Shelters

The improved shelters have been field tested successfully for more than one year at three locations in Lake Clark Pass, in Alaska. Conditions in the area include strong winds, driving rains, snow storms and temperatures as low as 50 degrees below zero.

The most efficient and wind-resistant gas burner yet designed has been incorporated in the thermoelectric generator units, 3M said. The company said the new burner is expected to provide long-term, unattended service with minimum maintenance.

The generators are designed to operate in subzero to 125 degree (Fahrenheit) temperatures, and from sea level to 10,000 feet above. A fuel vaporization system is supplied for severe artic installations. Solid-state lead tellurite alloys convert heat from the burners to electricity. Excess heat maintains interior shelter temperatures at optimum operational levels.

Free convection cooling, the basic thermoelectric properties of lead telluride, and the fact that the unit has no moving parts result in the power supply being especially adaptable to cold climate operation, 3M said. A generator supplying a nominal 50 watts at an ambient temperature of 70 degrees F. will provide 60 watts at –25 degrees at the same fuel setting—a 20 percent power increase.

This is one of three 3M portable communications shelters which have undergone testing in Alaska.

FCC Spurs Educational Financing

In FM broadcasting, multiplex operation is the simultaneous transmission of the main channel program and one or more subchannel programs on a single FM carrier. Under Commission rules, non-commercial educational FM stations may be granted authorization to provided limited types of subsidiary service on a multiplex basis.

The proposed rule changes would amend Section 73.593 of the rules. Sections 73.593 and 73.503 provide in substance that sub-channel multiplex operation by noncommercial educational FM stations must be entirely nonprofit and non-commercial. Section 73.503 permits noncommercial educational FM stations to broadcast programs produced or furnished by or at the expense of others, provided that no consideration is received by the licensee other than the furnishing of the material and costs incidental to production and broadcast.

Tuition Charge

The Commission's proposal for authorizing educational FM stations to charge tuition for multiplexed education courses was initiated by a petition filed by Educasting Systems, Inc., developer of an educational system involving four FM sub-channels. In the Educasting system, an instructor asks multiple choice questions over one channel, and a student, usually at home, utilizes a receiver with four buttons and pushes the button that he believes represents the correct answer. The student then receives a message over the channel he has selected, telling him if he is correct, and evaluating and discussing his answer.

The Commission has previously approved use of the Educasting system by commercial FM stations, including WFIL-FM, Philadelphia, Pennsylvania, as well as by one educational FM station on a free-of-charge basis. Educasting now wishes to have educational institutions use its system over their own FM stations or those to which they have access. Educasting would sell or lease the materials needed to the educational institution, which could then give the courses and charge tuition. If the educational system does not have an FM station itself, it could make ararngements with an FM educational station to present the material and to pay the station on a per-pupil or per-course basis.

The Commission stated that its proposal to permit charges for courses presented on the subcarriers of FM educational stations would apply not only to courses presented by or for educational institutions, but also to courses that are clearly of a public service nature and are presented through other agencies, as in the presentation of material for the blind through Federal or State government agencies.

Paying The Bill

To avoid undue commercialization of the educational FM service, the Commission said, it was proposing restrictions on the use of the Educasting system by educational FM stations requiring that the course or other material be presented by or for a **bona fide** educational institution, or, if not, that the licensee of the noncommercial FM station investigate the material and deem it to be clearly of educational or public service value. Also, the payment must be made to the educational institution or the noncommercial FM station, and the payments retained by the licensee must total no more than the approximate cost of conducting the subcarrier operation (including purchase or lease of equipment and course material) and general overhead and incidental operating costs. Where the material is presented by or for an educational institution or other entity, the payments made to the station or directly to the institution or entity may also include the usual tuition fees charged for similar material presented otherwise.

The Commisison stated that proposals for rule making on this subject should be limited by the concepts that nothing should be permitted that would tend to inhibit the maximum use of the main channel for true noncommercial educational broadcast service, and, since the frequencies involved are part of the bands allocated for broadcast service, that no uses should be permitted that are not either of a broadcast or "quasi-broadcast" character or closely related to a **bona fide** educational purpose.

Ampex Video Offers Courses

Ampex Video Institute (AVI), four-year-old closed circuit television instructional school, has gone on the road.

During the last quarter of 1970, AVI workshops were conducted in 23 cities in 18 states in addition to conventional five-day sessions at AVI headquarters in Elk Grove Village (suburban Chicago), Illinois. Three "road" workshops were held in conjunction with trade shows, one at Penn State University, and the remainder are on user or Ampex dealer premises.

James Crooks, director of AVI, said the extension of the training school reflects the growing development of advanced closed circuit production studios in education, industry, business and government. Training courses at the customer's own studio or the nearby dealer's training studio can be even more helpful than those in a classroom studio.

Advanced courses also teach use of studio-type viewfinder television cameras, more special effects and control equipment, color, tape editing, script writing and directing. Special technical courses on equipment servicing are offered only at AVI headquarters.

For continuing study, all students receive a CCTV workshop handbook, basic lighting handbook, graphic layout sheets, graphic products catalog and related equipment literature.

Interested organizations and individuals may contact the Ampex Video Institute at 2201 Lunt Avenue, Elk Grove Village, Illinois, 60007.

EDUCATIONAL BROADCASTING

Looking Inside Non-Commercial Broadcasting

By Walter Jung

NAEB Edges Forward

The NAEB show of 1970 is now behind us, leaving in its wake a bag of mixed feelings. There were some pluses, but then again there were some definite minuses.

In previous years the NAEB convention has almost run a par with NAB in terms of exhibits. This year's NAEB was noticeably smaller, with such large manufacturers as RCA, GE, Phillips and Sarkes Tarizan choosing to sit it out. And among those that did exhibit, the emphasis was on smaller budget operations—the ITV and closed circuit users. This is perhaps a reflection of the times as almost all of us are tightening our belts in one way or another. But although the big broadcaster's interest were not represented, there were many items of interest to the smaller scale users of television, audio and broadcasting equipment.

New Equipment

Several items shown are to be noted; a single tube color camera by Magnavox Video Systems; helical scan recorders with 1 μsec time base stability and ferrite heads by Ampex and IVC; and a working cartridge-loading video record/playback machine capable of color performance by Ampex. This latter device is called "Instavision" and is aimed at both the consumer and closed circuit field.

Now obviously these three things were not all that was exhibited. But the reason they are cited here is for a comparison to the trend of the general economy. How many studios can afford a 2-inch quad video recorder? Or a full blown 3-tube color camera with all the accessories? The answer is the big production centers, state public broadcast systems and so forth. How many of these are there compared to the campus ITV systems, smaller scale studios, cable systems and the like? It is obvious the littles far outnumber the bigs. With this fact in mind it seems we will be seeing more and more helical recorders with increasing quality-better time base stability (IVC demonstrated their 900 series [1] split screen with a live camera), better S/N, fewer dropouts, improved editing, better video processing and so forth.

Much work is being done in this area, and the helical recorder is coming close to being accepted for broadcast use. The impetus is certainly there, and it should only be a matter of time. Meanwhile the quality available for closed circuit users becomes increasingly higher.

Cameras

The camera scene is developing rapidly also. The Magnavox camera is similar in concept to RCA's single tube CCTV model[2] introduced last year. And for the same reasons, it is attractive to the closed circuit operator. Economy, ease of setup, operational simplicity are all important to the small system operator. He doesn't have the money, time and manpower required to properly set up and maintain a 3 to 4 tube camera. And operating one of the big multi-tube cameras can have its moments. Color balance and registration are meticulous processes which must be done regularly to maintain peak performance. Highlight control requires careful attention to clipping levels and iris in commonly used Pbo tube cameras due to their relatively small dynamic range.

Now contrast these factors with a vidicon camera. There is, of course, still a color balance operation but it is simplified. There is no registration process at all, since all video signals come through a single tube. Light level control is easily accomplished with a vidicon over a range of several thousand to one, independent of the video gain channel. And the natural gamma of the tube (.5) helps control highlights, So the basic attractiveness of a no-registration vidicon design offers features essential to a low budget operator. Granted, there are indeed tradeoffs. These cameras will not make a $75,000 picture, but then not everyone needs this fine a picture. Look for increasing activity along these lines of "simplified" camera designs.

The cassette-type recorder market is far too diversified to cover in detail here, but it is encouraging to note Ampex's entry is quite far along, offers full R/P capability in both mono and color, and most important, is a step towards standarization, using the EIA-J format. What the industry does not need is 20 different cassette formats with differing standards, no interchangeability and mixed degrees of R/P and color capability. The competiveness of ultimate consumer use will also be felt in the CCTV field.

Engineering Sessions

In contrast to the wide exhibit aisles, the engineering sessions of the convention were quite active, and Engineering Committee chairman F. Lee Morris reports well attended sessions throughout the three working days. The sessions this year took on a slightly different tack which seemed to go over well. There were more papers overall. This required more sessions, which were widely spaced, timewise. This was apparently no problem, attendance was good as all sessions were filled right up to the last day.

The sessions also covered a wider variety of topics, ranging beyond the engineers "meat" of nuts and bolts to such areas as management, legal aspects, training-subjects not previously covered. These too were well received. Engineering's PEG (see BE, November 1970) got in an encouraging session also, talk is already underway on expansion of the scope of activities.

Some important changes are underfoot as far as nationwide public broadcasting network distribution is concerned. PBS is setting up a new network distribution center to operate from Washington, D.C. Improved line service is in the offing also, all signal routing will be permanent through non-premptable lines, monitored and maintained similar to the commercial networks. PBS has become a member of VITEAC and expects to utilize VITS and participate in VIR testing. More emphasis will also be placed on audio, some examples of what is being done right now we hope to cover in detail next month.

So while some aspects of the convention looked bleak engineering wise, there was nevertheless important work done, and much more being done over the country. Public broadcasting has a future that has been described by some as optimistic. But it can only be as futuristic and progressive as those at work in the field. This is the true challenge to the educasting engineer. Educational broadcasting can apply not only to the public or students being served, but can apply equally well to ourselves. Are we taking every advantage open to us to improve our own skills and capability?

[1] see "A Helical-Scan Color Videotape Recorder for the Broadcaster" by K. Y. Reynolds, **Journal of the SMPTE,** October, 1970.

[2] see "A Single Vidicon Television Camera Systems" by L. Briel, **Journal of the SMPTE,** April 1970

"LET'S SETTLE THIS QUICK!···HOW ABOUT AN INSTANT REPLAY?"

AVOID PANIC MAINTENANCE

By Pat Finnegan*

When you have allowed yourself to be drawn into a mental panic situation, your reasoning is severely hampered. Under such a circumstance, costly time can be lost, and in some instances, additional equipment damage can result by wildly twisting knobs or flipping switches. To effectively do the job and avoid ulcers, an engineer who is naturally excitable must use discipline.

*BE Maintenance Editor and Engineering VP of WLBC, Muncie, Ind.

Contrary to what some people have to say about station maintenance, technical problems arise all the time. Routine station maintenance will catch many problems before they present drastic problems, but when trouble comes, it's time to trouble shoot.

When you look at the almost endless potential for technical problems at the station, it seems useless to discuss trouble shooting techniques in anything less than 10 volumes. What we intend to do here is not to really begin that impossible task, but to attack the problem from an equally important angle.

Panic periods usually come when we least expect them. That's why we panic . . . . among other reasons. These problems should subside as we put more transistors, diodes and IC's into our equipment. Trouble is, nothing is either perfect or forever trouble-free. And before we get into discussing trouble shooting one thing must be made clear: solid state components are here to stay, and unless we challenge ourselves, some potential panic situations could be severe. Remember, the basic laws that you've learned over the years still apply.

The Editor

The panic situation can reveal two things: lack of knowledge and the lack of a trouble shooting method.

Over a period of time, engineers develop individual methods. The method which is described here has been a successful one. It assumes a basic knowledge of fundamental electronics as well as some degree of specific knowledge of the system and equipment in question.

One Method

When an equipment failure occurs, first apply the technique of taking a figurative "step back" from the equipment. This mental "step back" is most important, especially for one who may tend to panic. This has the effect of mentally placing you outside the situation so that you can be objective, and at the same time it allows observation of what is happening from a wide view. It also allows the reasoning machinery to "get into gear." It is somewhat akin to the saying "look before you leap."

Proceed with the collection of data and facts which provide clues. As the facts and data come in, the reasoning powers are brought to bear, quickly sorting, discarding, isolating data until a solution is reached. As a solution is reached, a decision may be called for on the part of the engineer. But correction of a fault may not always be a simple matter. You will need to decide which will take less time: correcting the fault, selecting alternate routes, substituing equipment, or program readjustment.

Restating the method: (1) Take a mental step back from the equipment; (2) collect facts and data by careful observation of what is happening; (3) arrive at a solution by a reasoned judgement of the data uncovered; (4) make whatever decision that is required.

The careful observation of the events unfolding, collecting facts and data, should be done in a systematic manner. This brings up the technique of the wide view. First consider the system (or that part of the system in trouble), then narrow the view as clues suggest and reason dictates until the fault is isolated. This is like looking at a scene with a wide angle lens, slowly zooming in until a very tight closeup of one object in the scene is shown full screen.

The observation and investigation should be done in a systematic manner, making use of all the senses. Scan the chassis on both sides, look for obvious faults such as burned resistors, arc overs, or dripping capacitors. Obviously, you can smell burning wire and feel overheating parts. In many cases a faulty part will be spotted quickly. Even so, it may not be the real fault. Simply replacing the part would not be the entire solution. You should ask yourself what caused the part to fail.

For example, you have detected a burned and cracked resistor. If you assume this was the entire fault, it will burn and open up again if it is in series with a transistor or an internally shorted tube. Defective parts must be replaced, but before turning the equipment back on, an investigation should be made to find out why it failed. The failure may have been the part itself, it may have been underrated, or it may have been overloaded. But an answer should be found before returning the equipment to normal use.

This brings us to the point of reasoning. The reasoning applied should be cause and effect reasoning. When certain conditions exist (cause), certain results will be obtained (effect). The same process can be used in reverse, that is, certain effects have given causes.

You cannot very effectively bring reasoning to bear on a problem unless you have some knowledge upon which to base your investigation.

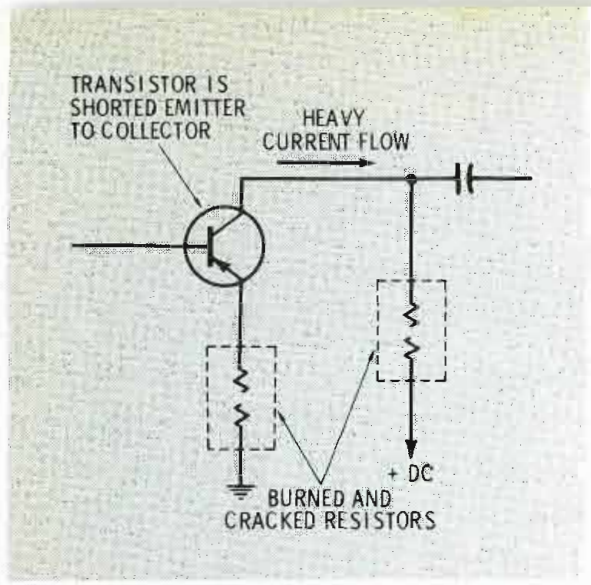


Fig. 1 Simply replacing obviously defective parts will not always solve the real problem. Here, the shorted transistor will only burn out replacement resistors.

This knowledge is threefold. First is that general knowledge of fundamentals acquired through schooling or electronic courses. The second is practical knowledge gained through experience in working with equipment. The third is specific knowledge of the equipment or system that is at fault. You may be weak in any or all three of these areas and still do an acceptable troubleshooting job, but it will take longer to accomplish.

Almost any station will have on file a wealth of practical technical information available in the equipment instruction manuals. In most cases, practical information and knowledge is what is used. You don't need to know how to design a circuit: you need only a fair idea of how the unit works.

A high percentage of the day to day problems are usually simple in themselves, although the on-air product may not look that way. A wrong key thrown, a dirty jack, sluggish relay, mixing non-synced video signals, a patch plug left out, transmitter left on dummy load are but a partial list of common daily problems. Because a high percentage of problems are easy to correct, the engineer who panics and the engineer who looks for the worst condition to have happened, can cause loss of air time and the panic can cause additional problems.

To illustrate this, consider a tape machine where oxide clogs the headwheel panel. An operator in panic may instantly start twisting every knob or adjustment he can lay his hands upon (and there are many). Before he gets through, the headwheel may be damaged. A lengthy and time consuming readjustment will be required. The engineer who looks for the worst possible fault may start adjusting the servos until he has everything out of adjustment. All that was needed in the first place was a good squirt of solvent onto the heads and the problem would have cleared itself.

The Method In Practice

To illustrate the method we have discussed in a trouble shooting situation, consider this problem. A radio station has its transmitter on remote control, transmitter located out of town, the only engineer on duty is also acting as a combo man. All is going along normally when suddenly the sound coming from the air monitor fails.

Anything from the program source (turntable playing a record) onward could be at fault, even to the point of having the antenna collapsed on the ground. Applying the technique of taking a mental step back from the equipment, and then observation of the station as a whole (wide view), collect facts and data.

Observing the console, he finds the VU meter kicking up normally. By knowledge of the system, he knows the VU meter is behind the line out key, so that everything, he reasons, is OK to this point. Again using his knowledge of the system, there is nothing much after his console but the Telco line and then the transmitter. Thus, he observes the transmitter readings and modulation monitor readings. These all appear normal. From this, he concludes that it must be the monitoring system.

Having a small portable radio handy, he tunes in the station and the music comes through loud and clear. But now a decision is called for as he is announcing and has no time to repair the monitor. He

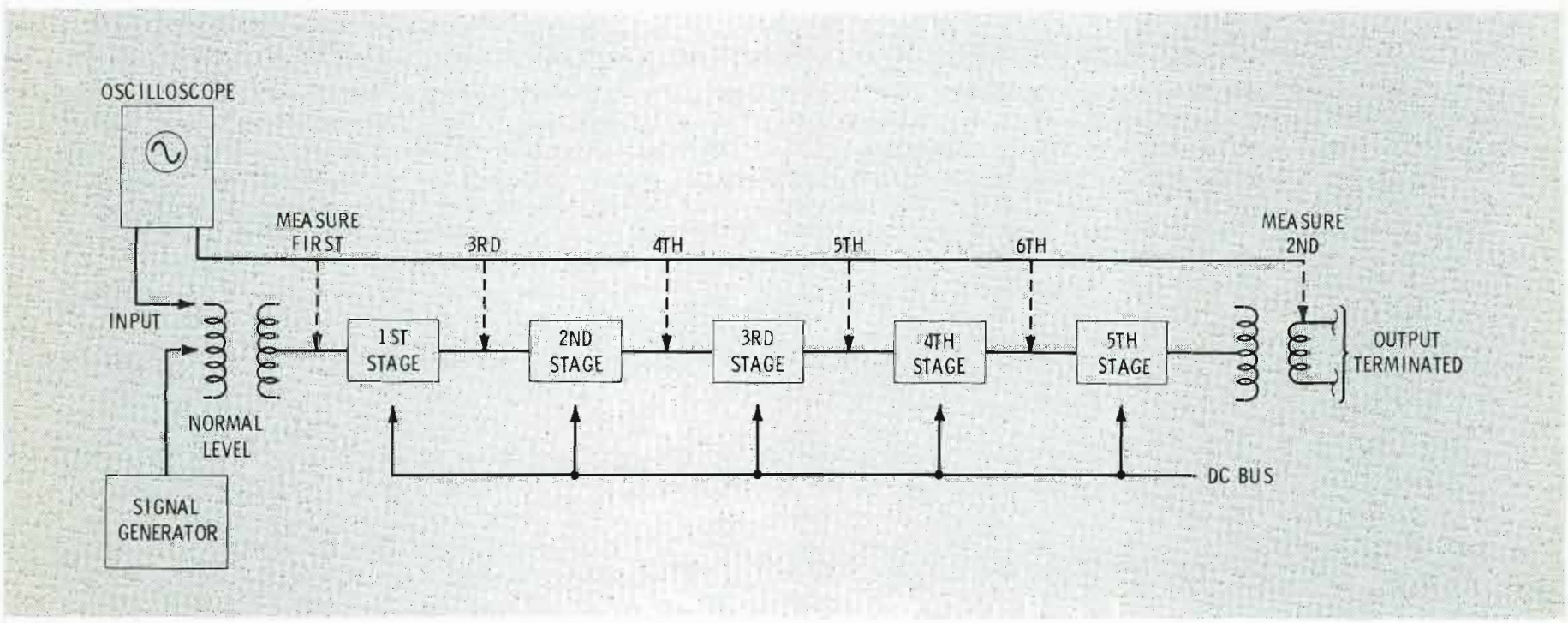


Fig. 2 Signal tracing is a fast isolation technique. First measure the input and output signals, then proceed from stage to stage until signal fails.

uses the portable radio as a monitor until he is free to investigate the fault in the air monitor. Thus, by the use of a systematic method he has quickly narrowed the problem and made a decision to use alternate equipment, all possibly before the record ran out, and the listening audience never knew he had a problem. If he had panicked, he may have been flipping switches, cutting the program off the air several times, or may have left the switch so the program stayed off. Or he may have kicked the transmitter on and off several times until something blew out there that necessitated a trip to the transmitter. What would you have done?

Signal Tracing

A fault must be isolated and identified before it can be corrected. When the system simply fails to pass the signal correctly (as opposed to one that went up in smoke), signal tracing provides the quickest isolating technique from the system on down to a faulty stage.

What is needed is a steady input signal and either checkpoints in a system or some detector in a unit. Program material often varies in amplitude so much that it is difficult to make adequate comparisons. An audio signal generator or a video bar generator (or slide), depending upon the equipment in trouble, will provide a stable, steady input signal that can be measured accurately. The detector may be an oscilloscope, multimeter, headphones, etc., again depending upon the equipment. The oscilloscope is handy when one is available, especially for bench work. In an audio system, a pair of headphones can be a versatile detector.

Amplifier Problem

For the remainder of this discussion, assume that we have an audio amplifier in trouble and on the bench for repair.

First apply the normal signal level input from a signal generator. Measure this level by an oscilloscope or whatever detector is available. Make sure the operating controls are in their normal positions.

Next, move the detector to the output of the amplifier (wide view). You may discover that there is nothing wrong with the unit itself. The problem may have been in an interconnecting cable or plug. But if there is a very low output signal or no signal at all, the problem is definitely in this unit.

Now that the wide view technique has isolated the problem to the unit itself, move the detector to the output of the first stage and proceed to the output stage itself. Where the signal is absent or very weak and perhaps distorted, the defective section is coming into view. But before concluding that a particular stage is at fault, the output of the following stage should be checked. The signal undergoes many transformations throughout the amplifier, so circuit design may be a factor. That is, the signal may be designed to be low at a particular point. A check at the output of the following stage will show the desired improvement if it is normal. If the signal is still failing at the point, most likely the fault is at the previous stage.

Once the suspected stage is isolated, the supply voltages to the stage should be checked. It could be that the particular stage is operating improperly because the power supply or series resistor is defective.

Signal tracing, then, allows trouble shooting to be done at a greater speed under dynamic conditions. Consider the amount of time you could spend if you used a different method, such as testing all the tubes on a tube checker (or transistors), measuring resistor values, checking all the capacitors for a short. Some engineers do use this method, but it is laborious and time consuming. For speed and accuracy, the signal tracing method can be the best place to start.

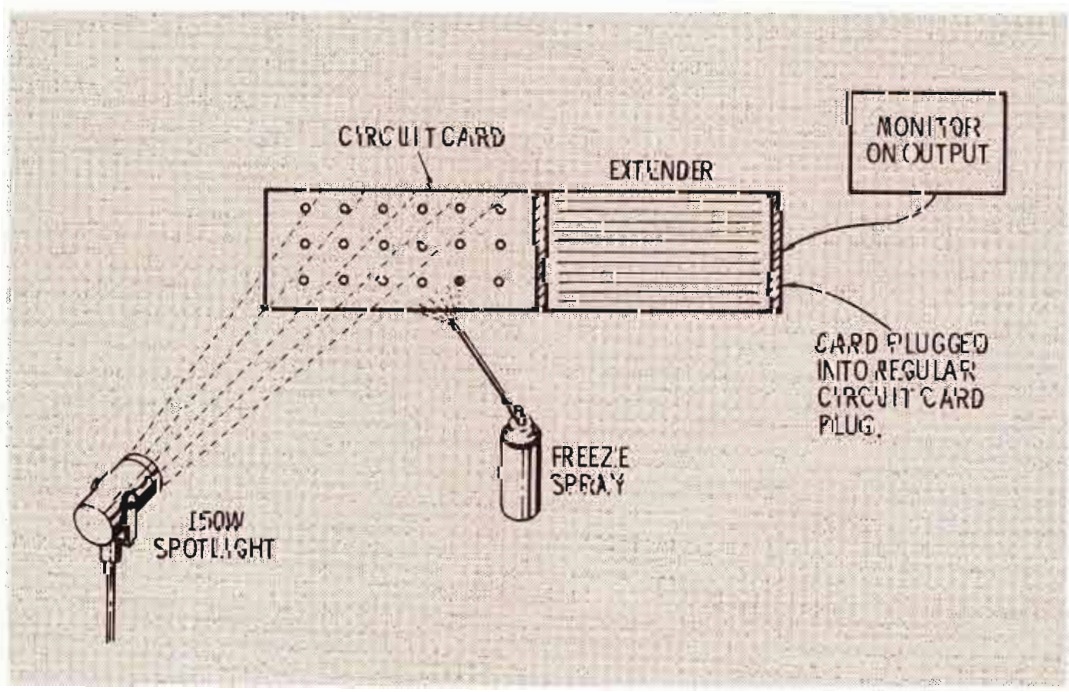


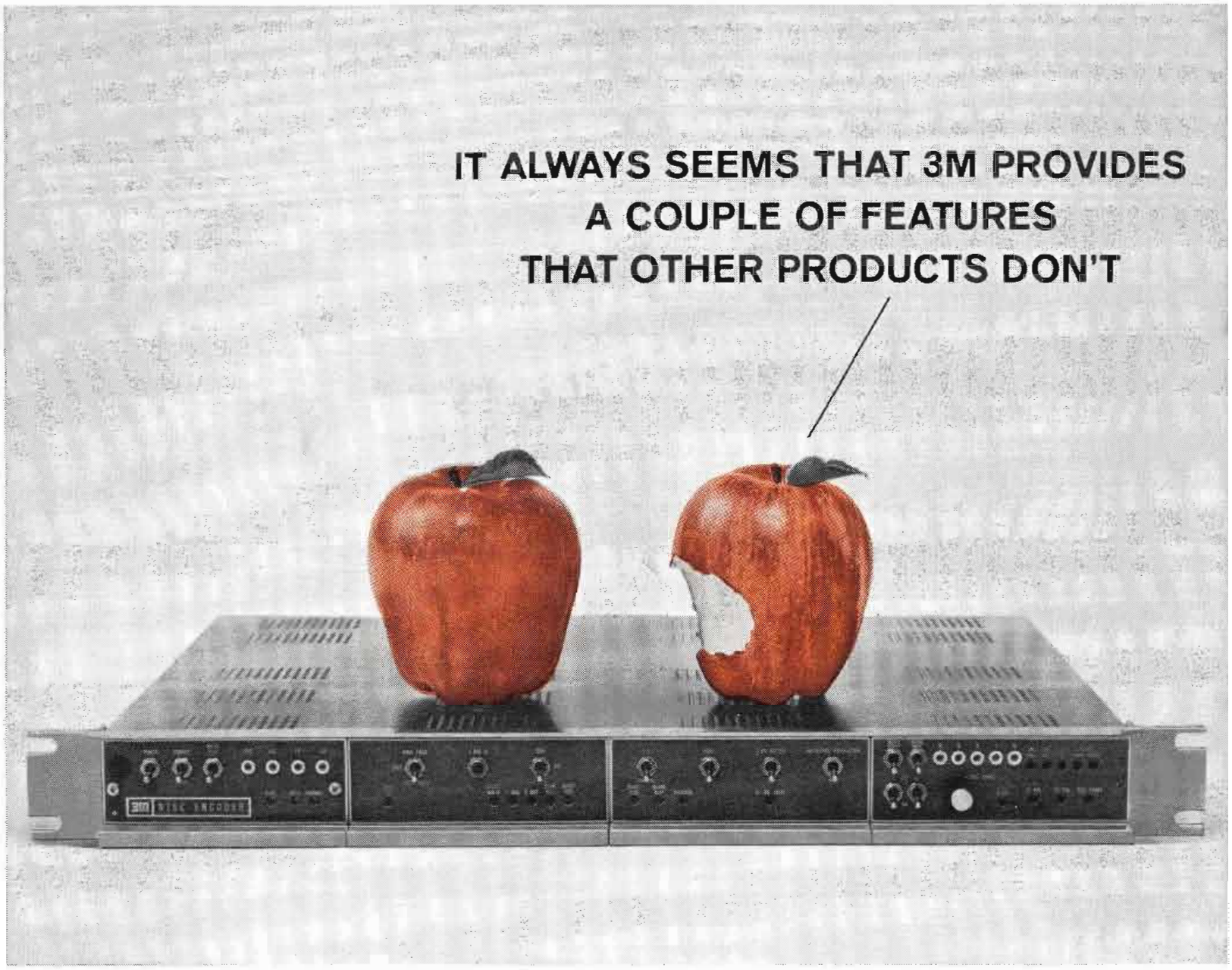
Fig. 3 The circuit being tested by the heating and cooling technique should have voltage applied. This technique is especially useful in finding intermittants.

Signal Failure

A high percentage of failures in tube equipment are filament failures. Simply scan the tubes to see which one is not lit. This works for a glass tube. Be careful, as some tubes have two filaments and only one may have failed. For metal tubes, feel the tube. Caution must be used as some tubes run very hot.

Many failures are due to intermittent or steady internal shorts. The technique of "tap analysis" may be used to quickly isolate the defective tube. Observe the output of the unit on a suitable monitoring device. Gently tap the tube of the first stage proceeding on to the final stage, at the same time observing the monitor. If there is an intermittent short in a stage, the monitor will indicate either a reappearance (or disappearance) of the signal, it may make all sorts of noises or give other indication that a sensitive spot has been touched. If logic dictates a tube short, don't trust the tube tester. Replace the tube.

The tube tapping technique can also be used as a signal tracing tech-



TAKE THIS 3M COLOR VIDEO ENCODER, FOR EXAMPLE...

The 3M Brand Color Encoder has two unique features not obtainable elsewhere. The color bar generator is one. It is **completely** digital, not partially digital. Simplifies setting up procedures, and maintains accuracy between encoders. Affords precision without adjustments. With digital you **know** it is accurate.

Another unique fact is that the 3M Color Encoder considers smaller, lower cost cameras as well as the big expensive ones. A method of input clamping is used on video signals that eliminates low frequency hum and noise and other unwanted effects on the matrix. If you have access to an SMPTE color test film (hand test over colored bolts of cloth) you can determine whether your camera needs clamping. If it does, you're in clover with this 3M Encoder.

The 3M Color Encoder is compatible with all 3-tube and 4-tube cameras, meets all applicable FCC and EIA specs. There's also a 2F notch filter in the horizontal aperture equalizer to prevent noise beyond camera frequency response.

Luminance enhancement at the flick of a switch assures a sharp picture even if registration is not perfect. With a 4-tube camera, enhancement is from the luminance tube. The green channel is used for enhancement in 3-tube cameras. Switching is on the front panel, as are **all** operation and setup controls, including notch filter.

Overall, you'll find that the 3M Brand Color Encoder is equal or superior to anything on the market yet costs somewhat less. Could we send a brochure?

Mincom Division 3M COMPANY

300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010

Circle Number 15 on Reader Reply Card

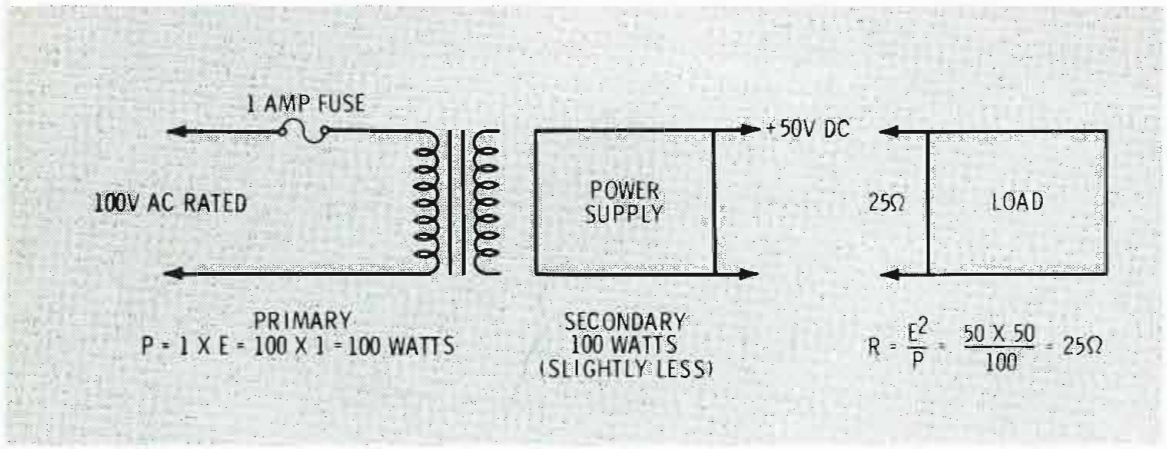


Fig. 4 A relative estimate of what DC bus voltage should be can be made by using rated value of primary fuse and voltage.

nique. Microphonics or other disturbances will be amplified as you progress from the input to the output. In this instance, the oscilloscope is the best detector to use, as microphonics cannot always be suitably measured or even heard, in some instances.

Solid State

Tube techniques are not very effective on solid state circuits. Many problems occur because of thermal runaway, or, rather, because of inadequate cooling of the transistor. If the problem is caused because of poor cooling, the circuit probably will work when it is out on an extender board, or if the whole unit is opened up on the bench. Apply heat from a soldering iron or a spot light to the suspected stage or stages. The more pinpointed the heat application, the easier it is to spot the defect. The iron, by the way, should not be placed directly on the case of the transistor, as this may damage the transistor.

Replace the transistor but make the check again. A new transistor may have a tendency to drift a bit under the heat treatment, but will restore as soon as it cools. If it runs away as did the original one, the problem is likely in the cooling around the stage. Heat sinks may be missing or air flow blocked.

When a lamp is all that is available to warm a large area, once the runaway has occurred, use one of the freeze sprays to each transistor starting from the input circuit. A stage under thermal runaway will correct itself almost immediately when the freeze spray hits it.

A coolant or freeze spray can be effective if used with a long, thin plastic tube as a nozzle. A short shot of the collant on a part or transistor may quickly reveal the answer. This test method is of little value unless you are, at the same time, making voltage readings. There really is no faster method of trouble shooting solid state circuits than taking voltage readings at each transistor in the suspected stage(s).

If you're concerned about applying too much heat to a solid state component when wiring it into the circuit, just hit it with a shot of coolant before soldering.

And just as you check a tube before you substitute it for a faulty one, check all solid state components before inserting them. (For further information on checking transistors, diodes and solid state circuits, be sure to read Carl Babcoke's series in the 1970 September, October, and November issues of BE.)

Capacitors And Resistors

The heating and cooling technique also works on other components, when heat is the culprit. A resistor may open or become noisy at its normal operating temperatures. The cooling will cause this condition to disappear almost immediately while it is cool, and reappear as soon as it heats up again. One word of caution. Do not apply the freeze spray to large power resistors as used in transmitters. When these are at operating temperatures, the sudden cooling by the freeze spray will cause them to crack.

Sometimes capacitors of the paper type will "leak" or intermittently short under abnormal heating (perhaps caused by heat radiation of a power resistor). The heating and freeze technique has pinpointed this problem on several occasions. But remember that prolonged heat to resistors can change their effective resistance.

Electrolytics or oil filled capacitors, when becoming defective, often will run hot or the case will swell, and they may leak. A visual inspection or touching them will often pinpoint a defective capacitor.

Power Supplies

A DC power supply blowing fuses may have an excessive load or there may be a short within the power supply itself. With the unit disconnected from the AC source, discharge the electrolytic capacitors.

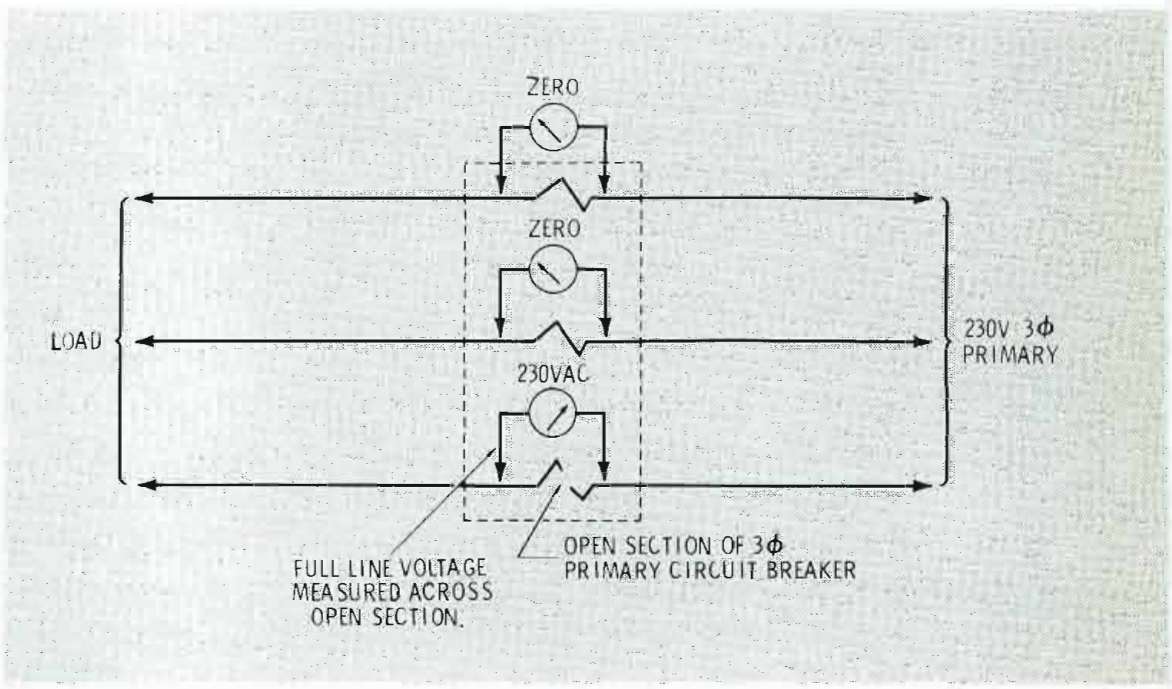


Fig. 5 One section of a three-phase primary circuit breaker is defective. AC voltage measured across the normal sections will read zero. Defective section will read full line voltage if it is open, less if not completely open.

First, a resistance check across the DC bus is made with an ohmmeter. If the bus is left connected to the power supply, there will be two circuit paths, one through the load and the other back into the power supply. The load by itself should read above 10,000 ohms for a tube circiruit. A solid state load circuit could be 15 to 20 ohms depending upon the load and what resistors are in series within the transistor collectors.

Measured back into the power supply, the resistance will depend upon the circuitry but should read low, but the reading should not be zero ohms. Inspection of the circuit schematic should give a quick indication of what path the ohmmeter current can take and therefore what approximate readings to expect. How much resistance should be read can be quickly estimated within reasonable limits. Observe the rated value of the primary fuse on the power supply.

The primary power can be quickly computed by Ohms Law, and the secondary power will be slightly less than this because of losses in the power transformer. For example, the power supply input is rated at 100 VAC and the rated fuse is 1 amp. This makes the maximum input power 100 watts. Now by Ohms Law, the secondary load will be $R=\frac{E^2}{P}$. If the DC bus voltage is to be 50 volts, then the bus resistance will be 2500 divided by 100=25 ohms. The normal current would be 2 amperes. This will give a fairly close approximation of what the load resistance should be. It will help determine quickly if there is a fault. It could be that the line voltage is running too high and the fuse is rated too close.

How about blown fuse or circuit breaker on primary circuits? Small fuses can be checked either visually or out of the circuit by an ohmmeter. Primary circuits cannot be that easily removed. Check these with an AC voltmeter across the individual fuse or breaker. The side of the line that is open will measure full or somewhat less than the line voltage, while the fuse or breaker that is properly closed will read zero voltage. When working around primary circuits, extreme caution must be taken as there is nothing between the power line source and that point. Accidentally brushing the test clip across the primaries or to ground can cause a blinding flash and cause burns. They can be lethal if you get across the primaries.

One side of a three phase high line is out. Inside the building, any three phase motors would be running slow and flourescent lights will be flickering or off. You can check voltage across the primaries. The one that is out will read low. This low voltage is coming from the other two phases that are operating and feeding through the equipment. Correction calls for Power Company people. If there is a high line pole outside, observe the fuses on the pole. One that has blown will be hanging down.

You may have occasion to check out the phasing of a long cable pair, but the color coding is so discolored as to be unreadable. Try this technique: first disconnect both ends of the pair. At one end, attach a small battery across the pair. Go to the other end and measure the battery voltage through he cable, observe the battery polarity. The battery polarity will quickly identify each wire.

Matching a single series fed AM antenna to a transmission line without a bridge can present a problem when there have been changes made in the system. Perhaps a contact has burned on the tuning coil and it is necessary to find a different position, or the shunt capacitor may have failed and been replaced but an exact value replacement was not on hand.

Insert an RF ammeter in series with the transmission line at each end. Turn on power, tune the final amplifier and adjust output until the correct antenna current is indicated. Note the readings on the two line meters, which are undoubtedly not the same. Turn off power and adjust the line side of the antenna coil one turn. Apply power resonate PA, etc. Again check meter readings.

If the capacitor was replaced or the center tap of the coil changed, this will require slight adjustments to the antenna side of the coil also. It is a cut and try method, but changes should be made in small increments. The original setting should have been marked on the coil so that all taps may be returned to the starting position if necessary. When the line current meters are the same reading, the antenna current correct, PA efficiency normal, a match has been obtained.

Each engineer should develop a troubleshooting method that works most of the time for him and in an efficient manner. He should develop individual techniques that will work in many general cases, and develop specific techniques that will be tailored to specific equipment. In any case, never make too many assumptions. Remember, Murphy's law may be at work. ▲

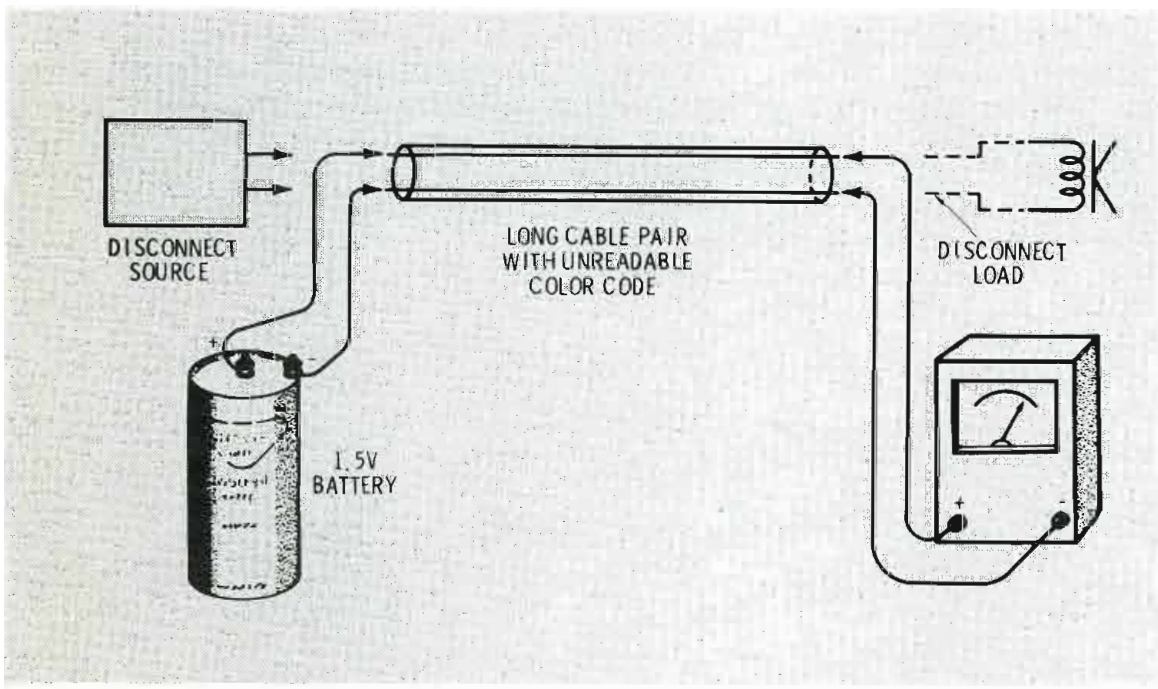


Fig. 6 You can make use of a dry cell battery and a DC voltmeter to check the phasing of a cable pair when the color code is undeadable.

Guidelines For Tape Cart

By David Herbert*

The modern tape cartridge machine is probably one of the greatest technical contributions to broadcasting since the invention of the radio transmitter. It is certainly the greatest work saver since the creation of the eight-hour nap.

But when the cartridge machine becomes defective, they can be a real monster to repair, if the grass roots engineer is not to familiar with some of the basic theories involved. Such a familiarization is the purpose of this short article.

There are essentially two parts to a cartridge machine relative to the electronic make-up of its personality and functions: (1) Audio electronics, and (2) Control electronics. Since most difficulties seem to come from the latter, we'll take a look at this angle in this discussion.

Figure 1 is the schematic of the control circuitry of a very simple machine. Let's go down the various functions of each component to get a little background in its intended operation.

Machine Operation

When the cartridge is inserted into the deck, it will strike a "leaf-action" switch or will be locked into place with a manually operated combination of switch and solenoid control in some machines. This causes the switch we'll call S1) to close, applying the control voltages (24 volts, 117 volts or other combinations of voltage depending on the make and model) to diode D1 and filter capacitor C1. This will cause the "ready" lamp to glow-indicating the machine's state of readiness. This applied voltage is also supplied to S2, which is a momentary contact, normally open pushbutton switch.

The purpose of D1 and C1 is the rectification (converting AC to DC) of the supply voltage from S1 to improve the operation and stability of the various relays and solenoid, and to help eliminate a potential source of hum within the machine's audio circuit. This circuit will vary greatly from machine to machine, but you'll find it, for the most part, contains these parts in one configuration or another.

Getting back to S2. When it is depressed, it will cause the power to go through the normally-closed contacts of S3 (a momentary contact switch similar to S2). When S3 is depressed, it will cause the volt-

*Chief Engineer. KXRO, Aberdeen, Wash.

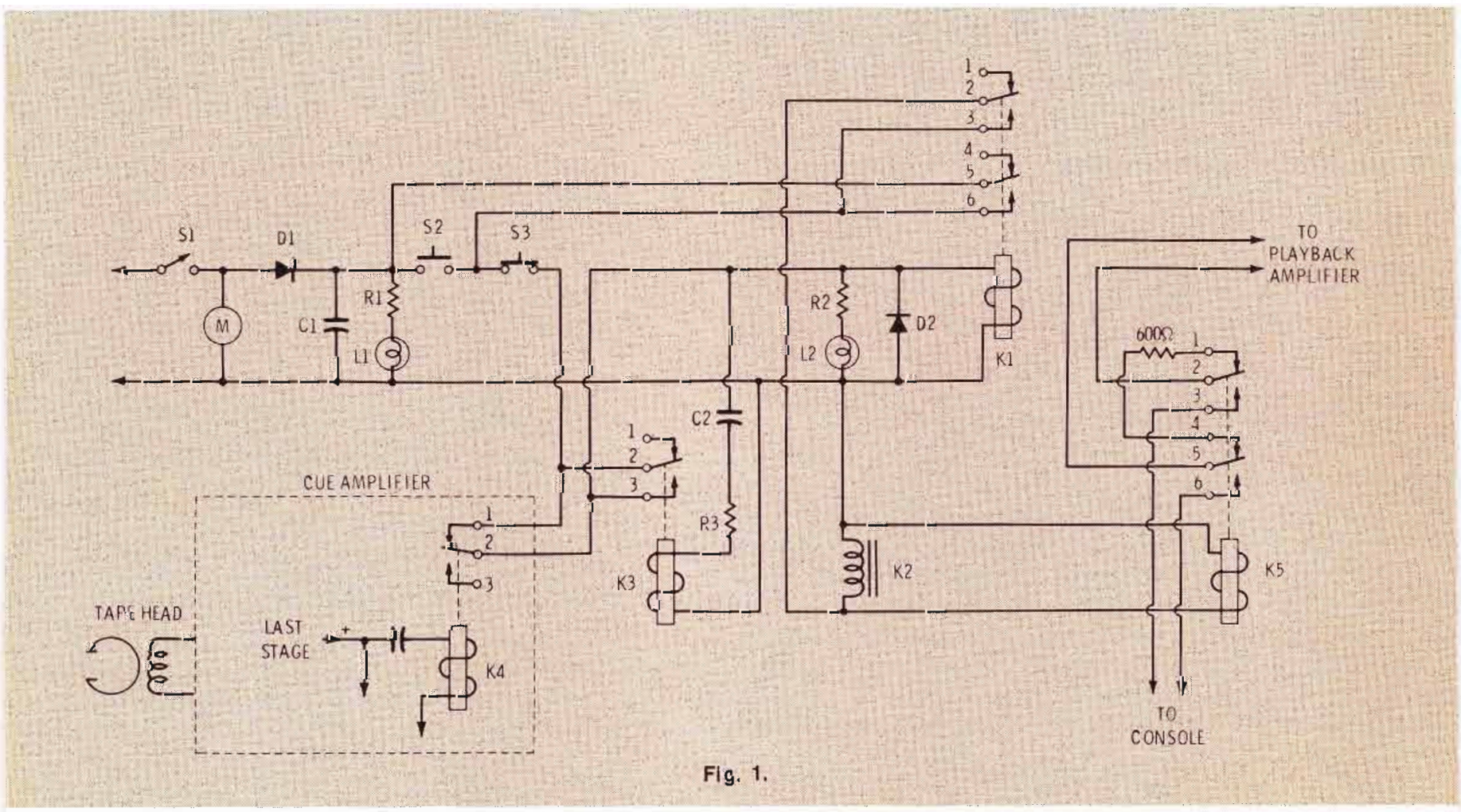


Fig. 1.

age to be removed from the control relays, causing the machine to stop.

From the contacts of K4, the voltage appears on the windings of K1, which is the start relay. The voltage across this relay causes lamp L2 to light up through R2, indicating the machine is in the "run" mode. This voltage also causes the relay to activate, closing the contacts between terminals 5 and 6, which will insure that this voltage will appear across K1 by shorting across S2, the start button.

The activation of the start relay will also cause the capstan solenoid, K2, through terminals 2 and 3 of K1, to be activated and will therefore, pull the pressure against the capstan causing tape motion. Besides the activation of the solenoid, this voltage also (on most makes and models) will activate another relay, K5. This relay will connect (external) when the machine starts running and will connect the playback (audio) amplifier to a 600 ohm resistor when it stops.

Now, let us consider what happens when the machine starts on normal operation. The first thing that will happen (besides what we've previously discussed) is the same cue tone that appears on the tape to make the machine stop will still be at the cue head, and will be amplified by the cue amplifier and appear at relay K4. Normally this tone will activate K4, breaking the normally-closed contacts across terminals 1 and 2, thereby removing the voltage across K1. The machine will stop playing.

We provide relay K3 to keep the machine playing when the cycle is started and the cue amplifier relay K4 opens the control circuit. This relay, through contacts 2 and 3, is connected in parallel with relay K4, contacts 1 and 2. When the start cycle is commenced and K1 is energized, K3 is also energized through the RC network R3 and C2. Due to the nature of this RC network, this relay (K3) will only be energized for ¼ to ½ second, thus defeating the effect of an open circuit to K1 by shorting out terminals 1 and 2 and allowing what we could say is a normal start. The reason K3 is activated for such a short time is so the machine will be ready to stop, when intended, as quickly as possible.

Diode D2 is intended to insure that the magnetic field caused by the de-activation of relays K1 and K5, along with the solenoid K2, and the attendant action of their associated switch and plunger assemblies will not cause any further activity in the control circuit.

Oh yes, we also want to understand that the motor for the cartridge deck is connected across switch S1 so as to start when the cartridge is properly inserted (in most units).

It is not the purpose of this text to apply a complete or thorough discussion of every "cart" machine ever manufactured, but to give the reader an understanding of the basic machine operations and functions. Obviously, the circuitry involved and related theory will be quite different from each make and model used these days, but the machines the author is familiar with utilize the previously discussed principles.

The Deck Mechanism

The capstan solenoid mentioned previously is physically associated with the tape deck. It is not shown in Figure 2a because it's position with respect to the deck is different with various makes of playback decks. It's primary purpose is the pulling of the pressure roller against the capstan at the proper moment to force the tape within the cartridge

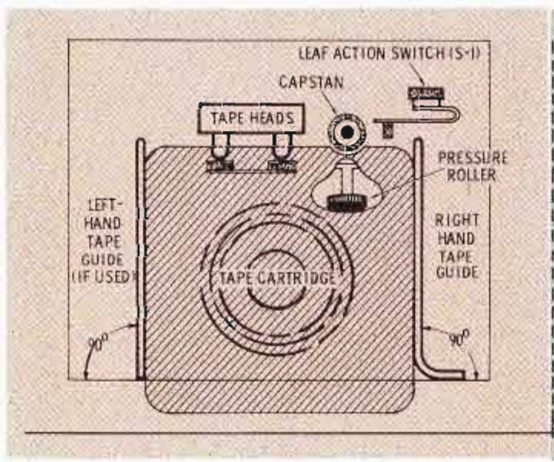


Fig. 2A

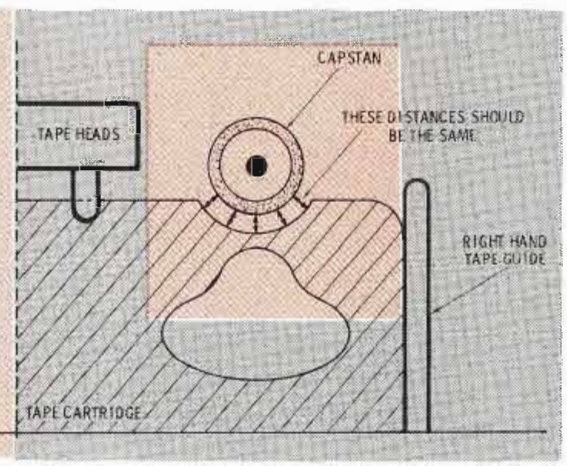


Fig. 2B

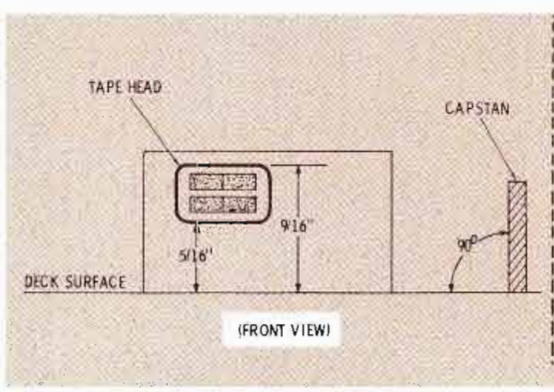


Fig. 3A

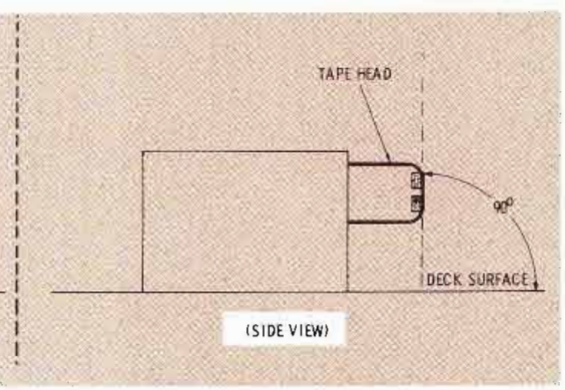


Fig. 3B

to travel past the head(s) at the proper speed as required. Most solenoids should operate relatively quiet, and noisy operation could eventually cause not only objectional noise but the machine to "shake itself to pieces." The machine's instruction manual should help you in the proper adjustment, routine care, and mounting of the solenoid. Don't be afraid to use the instruction manual, or write the manufacturer if you don't have one, to help you to give the solenoid its proper attention.

I won't get too far into the deck except to point out a couple of important facts. Referring to Figure 2a, the author has found most machines will perform best when the right hand cartridge guide is at a 90 degree angle to the front edge of the deck. If the deck has a left hand guide, it, too, should be at a 90 degree angle to the front edge of the deck. Both guides should place the cartridge to the capstan in the position indicated in Figure 2b. The tape head(s) should penetrate the cartridge equally.

Let's now study some common cartridge machine failures and their most probable cause:

SYMPTOM	PROBABLE CAUSE AND CURE
1. Machine won't recue	1. defective K4; check and replace if necessary 2. component(s) in cue amplifier defective; check & replace defective component 3. cue head out of alignment or detive; check & align 4. gain in cue amplifier not turned high enough; adjust
2. Machine starts when cart is inserted without pressing start button.	1. shorter S2 or terminals or contacts on K1; check 2. contacts on K1 "stuck"; examine relay-operation should be "free" 3. component(s) in cue amplifier defective; check & replace defective component
3. Nothing happens when cart is inserted properly and start button is pushed: "ready" light **does** come on.	1. open contacts or broken connections on S3; check and replace if necessary
4. Nothing happens when cart is inserted properly and start button is pushed: "ready" light **does not** come on.	1. defective D1, S1, or C1; check
5. No sound	1. defective or shorted K5; check 2. defective component(s) in playback amplifier; check & replace defective component(s)
6. Solenoid "bangs" against capstan for the first second or two when the start button is pushed.	1. defctive or shorted K3; check 2. R3 or C2 defective; check 3. defective component(s) in cue amplifier; check and replace defective comopnent(s)
7. Cartridge stops playing prematurely.	1. see item #4 above 2. cartridge not inserted correctly; reinsert cart 3. defective D2; check and replace if necessary 4. K1 defective or not plugged in completely—check and replace if necessary

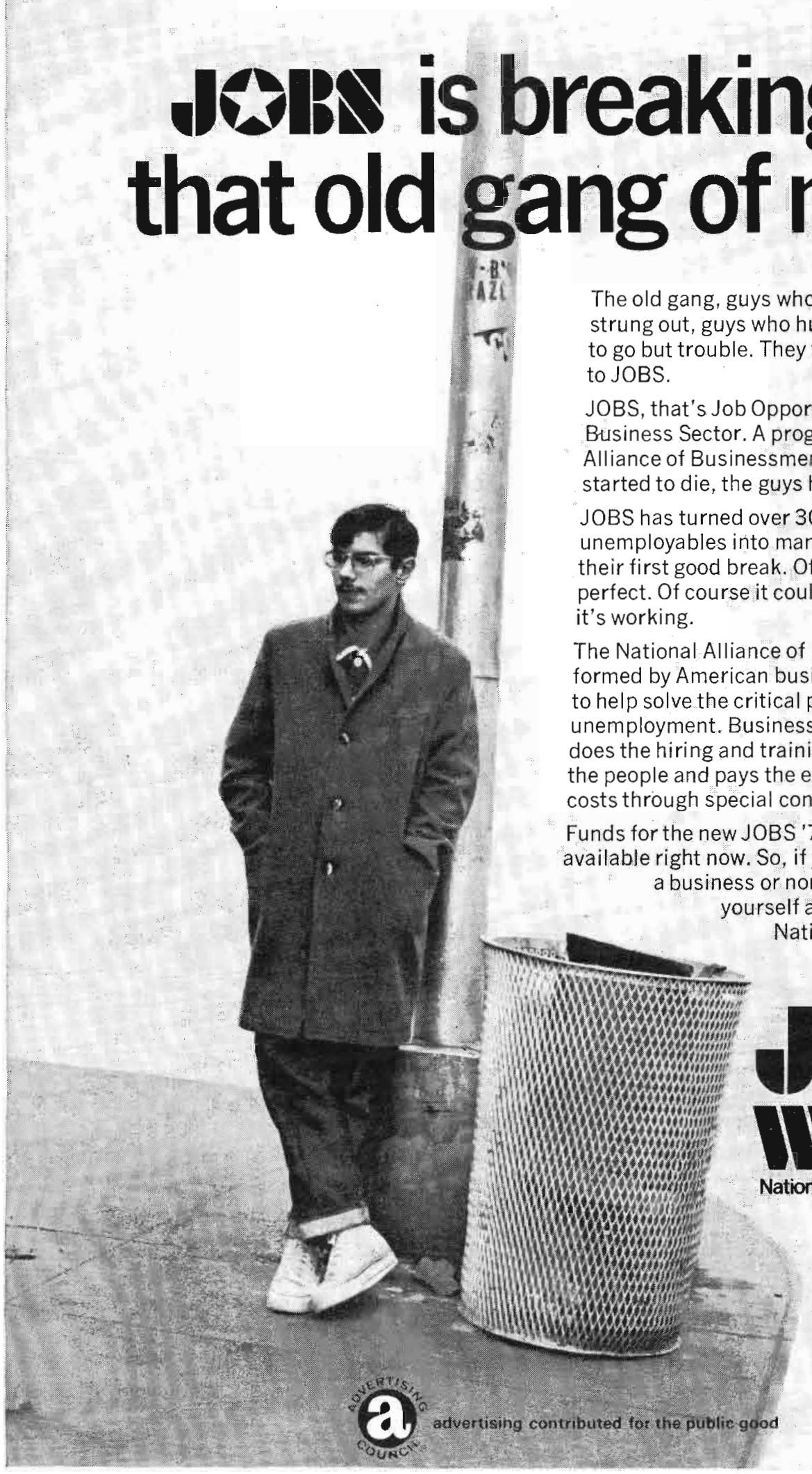
Figure 3a shows the tape head(s) and capstan from the front elevation. The capstan should be at a 90 degree angle to the top of the deck surface in all directions. The height of the head(s) should fall 5/16″ above the deck surface to the bottom edge of the pole piece and 9/16″ to the top edge of the pole piece. You'll find Nortronics Form No. 7195B very suitable for this purpose. This adjustment will help to keep the cue tones off the program material and vice versa.

In Figure 3b, the taps (head(s) is shown from the side. The head should be mounted so the face, or front of the head, is at a 90 degree angle to the deck surface. (Again, Nortronics Form No. 7195B comes in handy.) After these factors are satisfied, then the azmuth should be adjusted with an alignment tape. These tapes are made by almost all cartridge machine and tape head manufacturers, and are really the only way to align a tape head. A tape head that is out of alignment will sound "muddy", distorted, and hard to understand. Remember, after all the proper adjustments are made, go back and check just to make sure they are still "on", as some of these adjustments tend to throw the others "out". Keep on adjusting until you don't have to adjust anymore.

Use The Manual

There is no substitute for a good instruction manual and being thoroughly familiar with it. Don't be afraid to call the manufacturer on the telephone or write him a letter if you're having problems. Simply cleaning the heads and roller assemblies occasionally isn't enough. Once a month or so, take the machines apart and clean them. Check and replace the tubes if necessary. Make certain the relays are secure and clean. Use original manufacturer replacement parts when necessary and possible. All these things will greatly enhance the reliability of your machines . . . and reliability means fewer "fouled-up spots" (technically, that is.) ▲

JOBS is breaking up that old gang of mine



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

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

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

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

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

JOBS WORKS

National Alliance of Businessmen

ADVERTISING COUNCIL

advertising contributed for the public good

Emergency power for

By Leo G. Sands*

A CATV system is only as reliable as its power sources. Note that "sources" is plural. Except in very small systems, operating power for line amplifiers and head end equipment is fed in at more than one point. Even when all power is furnished by one power company or even one major power transmission circuit, a power failure might not affect all power input points. Power failures are more frequent in rural areas and where severe weather conditions prevail. Recently, catastropic power failures have hit big cities, even New York. No place is totally immune to failure of utility power.

When a power failure affects an entire community, few subscribers will complain if the CATV system is non-operational during the power failure since all TV receivers will also be non-operational except for the relatively few receivers that operate from internal batteries. However, when a power failure affects only the CATV system, subscribers will compain.

It is customary to provide AC power at the head end, and to inject low voltage AC power into the trunk cable at regular intervals, and near major distribution points, as illustrated in Figure 1. Failure of power at any point ahead of the first bridger or distribution amplifier will shut down the entire system. Beyond the point where distribution begins, a power failure at one location will cause shutdown of only a part of the system. But, a power failure at any point should be avoided.

The need for power at the head end is obvious, even to the layman. It is also necessary to provide power to all trunk, bridger, distribution and line extender amplifiers. As shown in Figure 2, it is common practice to inject AC power at 24 to 60 volts into the coaxial cable for operating a number of line amplifiers. The amplifiers are in cascade with regard to the signals, but in parallel with regard to the AC supply voltage.

The number of line amplifiers that can be powered from one power injection point is limited by the voltage drop through the cable. This drop is not uniform when power is fed to two or more amplifiers per leg. More current flows in the cable section to the first amplifier than beyond, as Figure 3 shows. Therefore, the voltage at the power input terminals of all the amplifiers is not the same.

Each amplifier housing contains a rectifier power supply to provide the required DC operating voltages. And the more sophisticated types include a voltage regulator. The regulator not only offsets load current variations, but also ensures that all amplifiers receive the same DC voltages even if their AC input voltages differ.

*BE CATV Editor and President of Leo G. Sands & Associates, New York, N.Y.

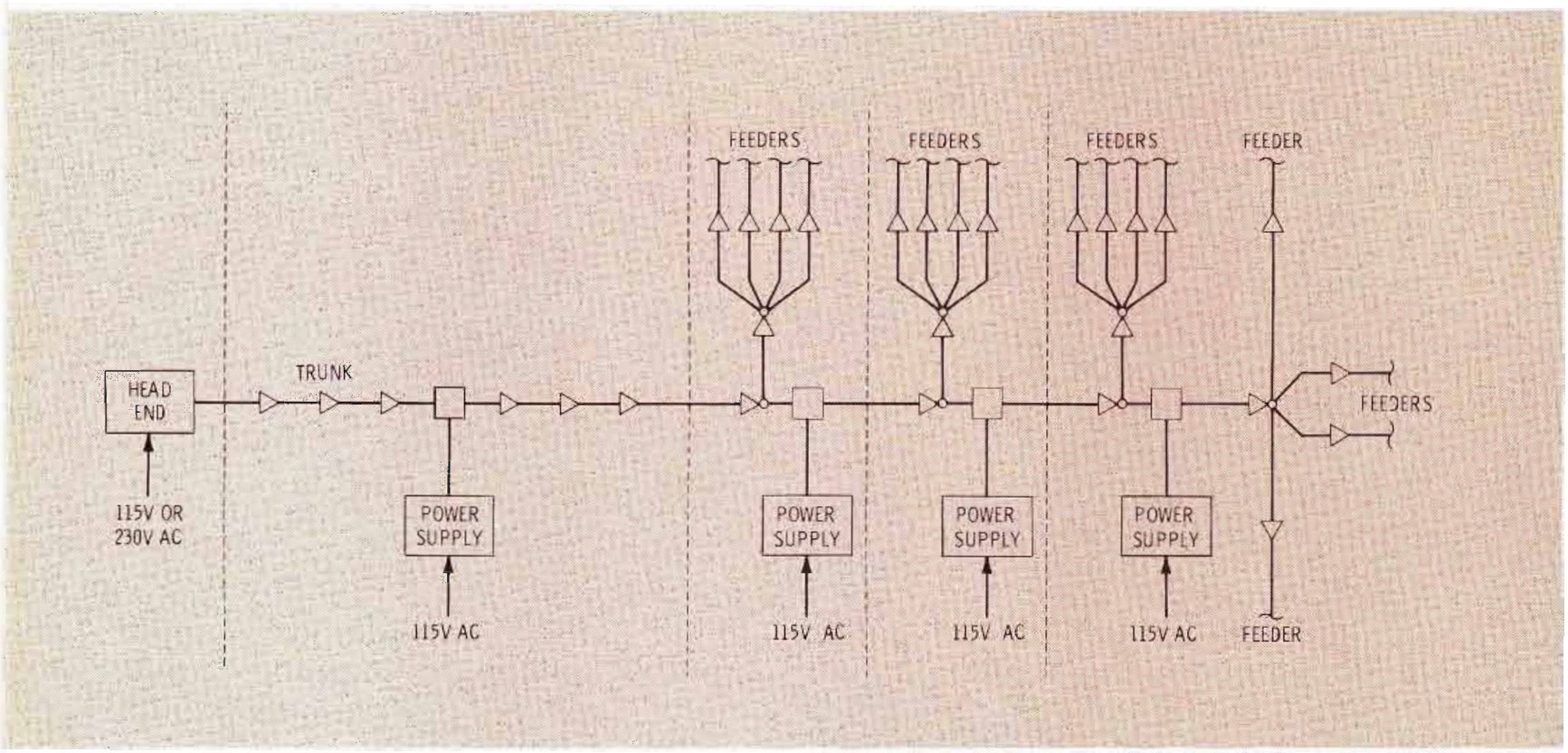


Fig. 1 Example of CATV system powering. Dotted lines show sections served by each power supply.

CATV

At the AC power injection points, the power supply contains a step-down transformer and an RF filter network which prevents the power supply from affecting the signal path through the coaxial cable. The transformer may be of the conventional type or of the voltage regulated type. Primary power is usually obtained from the nearest power line. To minimize injection of noise into the signal circuit, the power supply may contain a power line filter. And in areas where thunderstorms are frequent, an integral or external surge protector may be provided.

Since a power failure at any power injection point along the trunk cable can cause shutdown of all or a major part of the CATV system, it would be advantageous to provide a back-up power source. If the cost of a back-up power source can be justified depends upon the known reliability of the primary power source and the economic and public relations effects of system interruptions.

The back-up power source can be a regulated, solid state DC to AC inverter and a 12-volt storage battery kept charged by the primary power source (through a charger) as shown in Figure 4, or by a thermo-electric generator. In some areas the use of a wind-driven generator or bank of solar cells is feasible. Effective, but too costly to maintain and install, is an engine-driven alternator. Figure 5 shows an alternative power system arrangement.

When anticipated power failures are of short duration, an inverter, battery and line-powered charger will suffice. In the event of extended power failure, a portable engine-driven generator for recharging the battery, or a replacement battery can be taken to the site.

A major problem is the provision of suitable protection of the backup-power source from the elements and against vandalism.

Considerably more power is usu-

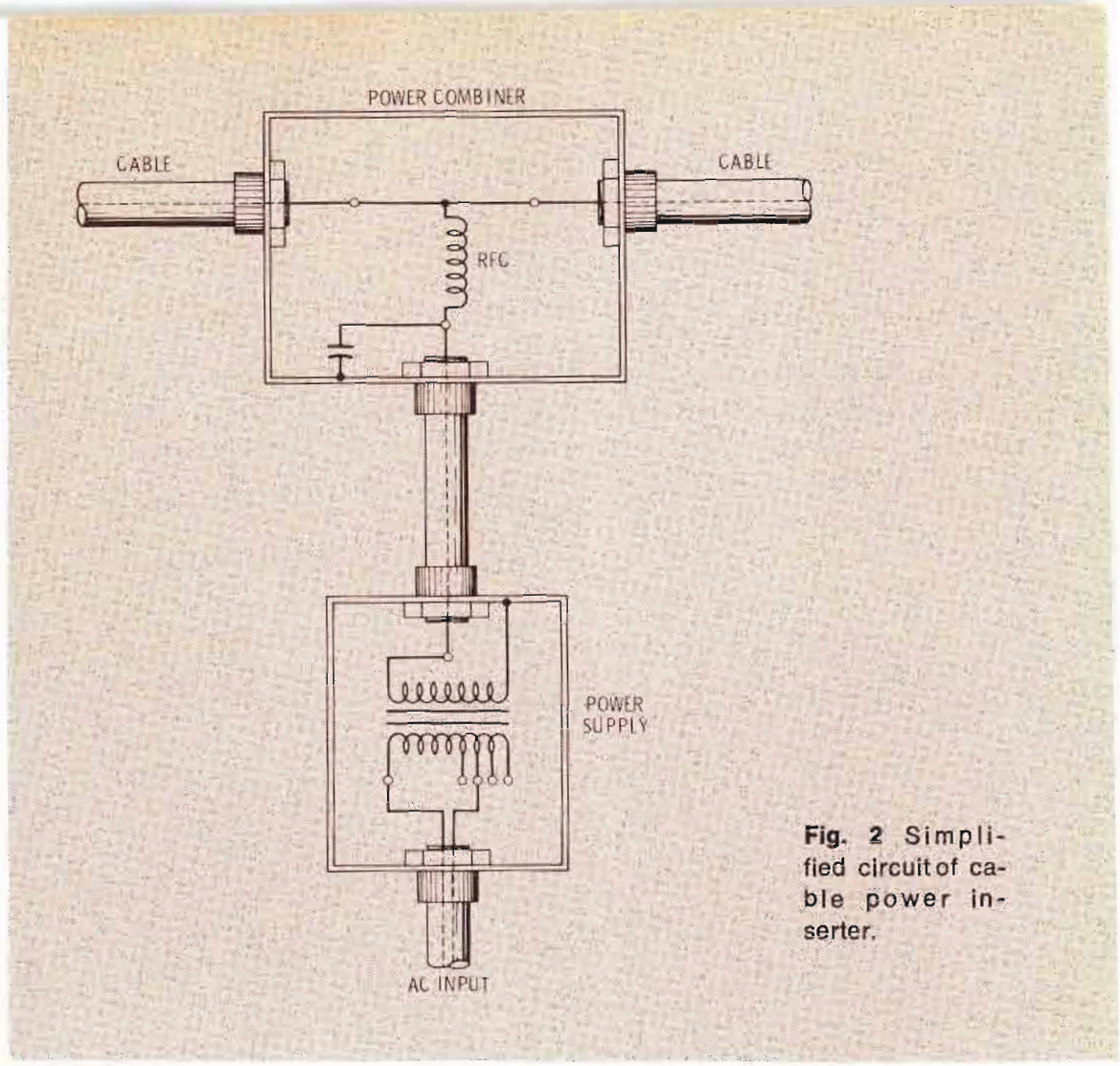


Fig. 2 Simplified circuit of cable power inserter.

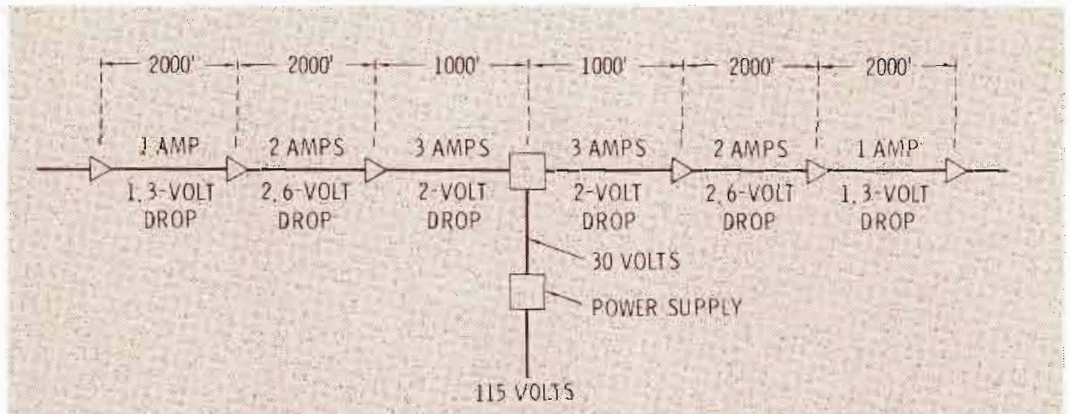


Fig. 3 Example of voltage drops due to loop resistance.

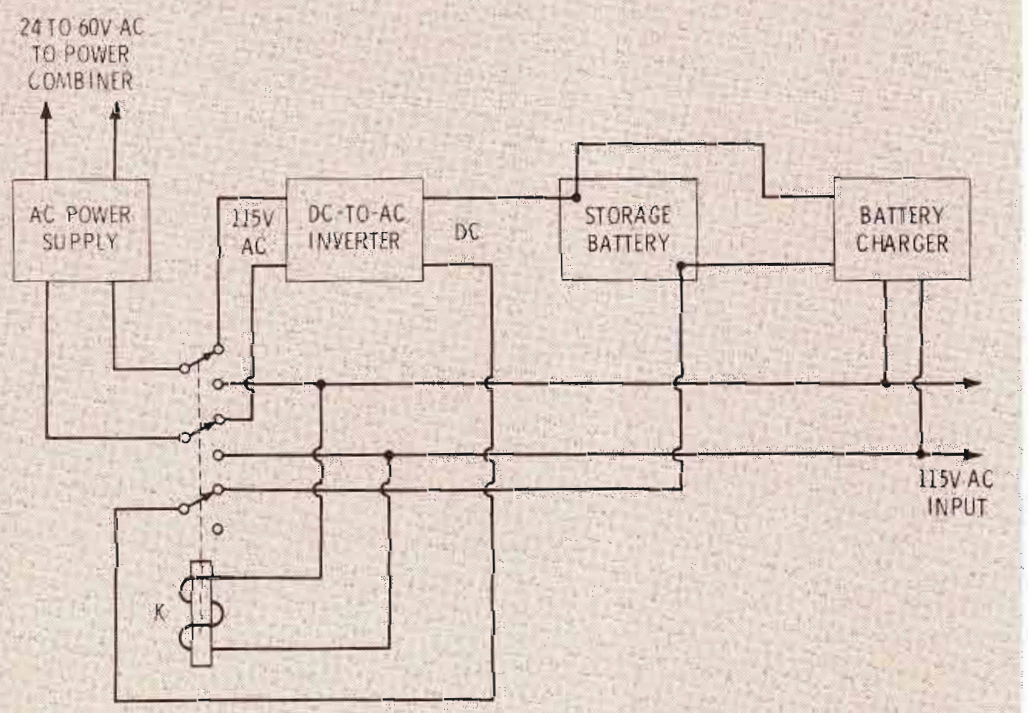


Fig. 4 Back-up power system for cable power insertion point. When utility power fails, relay K releases and its back contacts connect DC to the inverter and the AC power supply input to the inverter output.

ally required at the head end than at the cable power injection points. When solid state head end equipment is used, power requirements may be quite modest. But, power may also be required, even during power line failures, for operating lights, test equipment, local program origination equipment, etc.

An engine-driven alternator is an excellent back-up power source at the head end. It can be installed in its own shelter adjacent to the head end shelter, and can be of the manual-start or automatic-start type. It may use gasoline or propane gas as fuel.

Where head end power requirements are minimal, or can be reduced during times when utility power is not available, a 12-, 24- or 48-volt battery and inverter can be used. The battery can be kept charged normally by a line-operated charger, and during emergencies by an engine-driven generator.

Solid state DC or AC inverters for both cable power injection points and the head end are available in high-reliability, continuous duty types from numerous power supply manufacturers. The consumer-grade types intended for intermittent duty in cars should not be considered. The sophisticated types have excellent voltage regulation and should include RFI and transient protection.

While inverters may require no maintenance except routine checkout, batteries and engine-driven alternators and generators need attention, even if infrequently utilized. Also, both are affected by temperature extremes.

The emergency power requirements of a CATV system are quite different and more complex than those of a broadcasting station. With numerous points requiring back-up power, the costs of apparatus, maintenance, installation and protection can be significant. On the other hand, downtime can be very costly when all factors are considered.

As we move toward bi-directional systems and the multitude of options they may afford, the power requirements will become even more critical. ▲

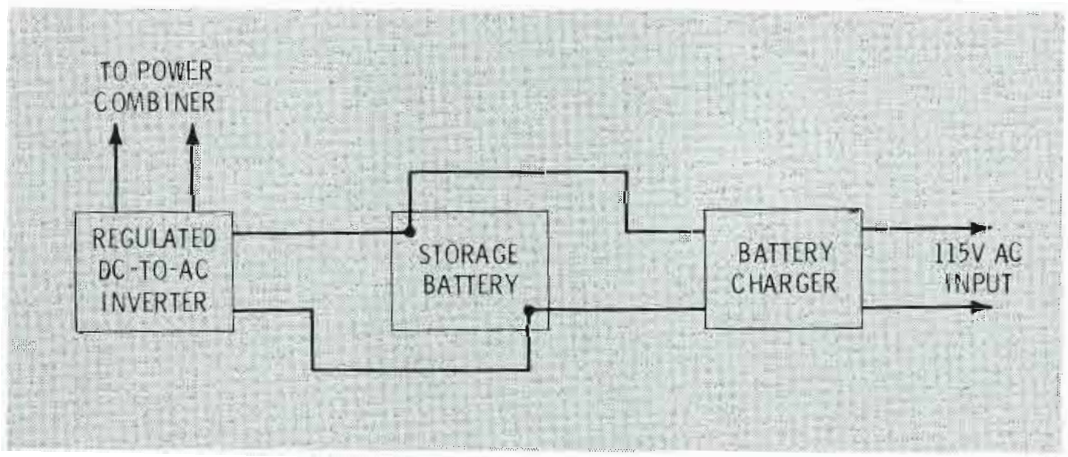
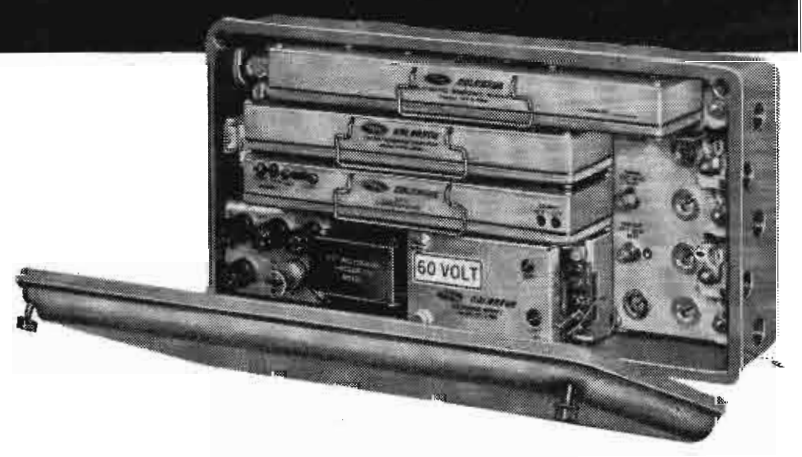


Fig. 5 Cable power supply system which operates continuously from DC from an automatic battery charger and from the battery when utility power fails. No switching is required.

Now that CATV is finally coming of age, who do you think was there helping it along all the time?

AEL Communications Corp.



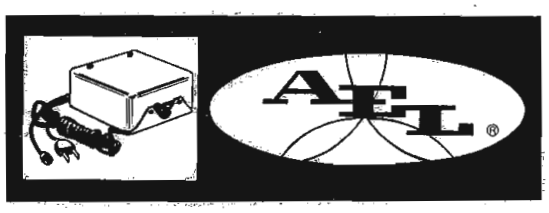
That's who.

Because, at AEL, we realized long ago that CATV was something special. That it wasn't going to be a passing fancy. And now that CATV is finally coming of age, AEL is proud! We've helped it come a long way.

Since the beginning, AEL has produced, through research and development in the laboratory and the field, advanced electronic designs for today's CATV systems. Advanced designs such as the new AEL SUPER-BAND® *Tunerless* CONVERTER that expands any SUPER-BAND CATV system to 19 channels quickly and easily.

It's been developments such as this that has enabled CATV to come as far as it has.

If you're contemplating a CATV system, let AEL help you too. In this way you'll be turning on to the best.



COLORVUE

AEL COMMUNICATIONS CORP.

Subsidiary of AMERICAN ELECTRONIC LABORATORIES, INC.

P.O. Box 507 • Lansdale, Pa. 19446 • (215) 822-2929 • TWX: 510-661-4976 • Cable: **AMERLAB**

Circle Number 17 on Reader Reply Card

Network VIR signals provide critical tests

By Harry Etkin*

In 1969 the Joint Committee for Intersociety Coordination (JCIC) asked the Broadcast Television Systems Committee (BTS) of the Electronic Industries Association to study technical measures which might improve the quality and consistency of color television reception.

One of these measures has been the devising of a vertical interval reference (VIR) signal to accompany the video waveform from its point of generation throughout the entire television system. The VIR signal is intended to appear on Line 20 of the television raster.

Prototype equipment to generate the VIR signal has been built and one sample generator has been furnished to ABC, CBS, NBC and CBC. Field tests have been under way on the three U.S. networks since September 1, 1970.

The field tests are being carried out with approval of the Federal Communications Commission. During the field testing of the VIR signal, the FCC will not enforce Section 73.682 (a) (21) (iv) of the Rules and Regulations relating to the one-half line guard interval. This article describes the VIR signal and its use and tells what the BTS committee hopes to accomplish during the field testing.

The Problem As The Home Viewer Sees It

The two most common shortcomings which are annoying to the home viewer usually are:

1. Although the color controls are set, the hue does not remain within acceptable limits. This results in a frequent reset of the hue control. This is true when the TV color receiver is switched to different channels and with different shows on the same channel. The hue control may need adjustment between different color movies, commercials between shows, the entertainment part of the color program, local and network presentations, and locations where different signal sources and switched to form the program output. In many cases, variations in lighting at the picture source, improper chrominance levels, incorrect phase relation between color burst and picture information and differences in the position and duration of the color burst are some of the factors which will contribute to the variation in hue at the TV receiver.

2. The receiver saturation control may have to be reset frequently when the saturation changes exceed acceptable limits. This is normally caused by any distortion of the amplitude versus frequency response in the TV system. In some TV receiver models, manufacturers have attempted to minimize these difficulties by the use of various automatic color and tint control circuits. These circuits use the amplitude or energy of the color burst as a reference to set the chrominance channel gain in the TV receiver. However, the present FCC color signal specifications are quite loosely set and cumulative tolerance may give rise to variations of as much as 10 dB in the chrominance-to-burst ratio.

Receiver Developments

TV receiver manufacturers have incorporated automatic chrominance and tint corrector circuits which to some extent automatially correct the color and tint deficiencies. Zenith has its "Automatic Tint Guard", RCA its "Accu-Color", Admiral the "Color Monitor", Philco-Ford "Automatic Picture Setting". The color, tint, brightness and contrast of the Hitachi set are preset at the factory but can usually be reset either by the home viewer or a technician. Motorola, Sears, Magnavox, Sylvania and General Electric will soon add their names to the list of color TV manufacturers who will offer TV color sets to the viewer which are intended to maintain proper flesh tones independent of TV broadcast changes.

An unfortunate consequence of many of these receiver "corrective" circuits is that some of them incorporate a reduction in gain of the chrominance "Q" channel in the receiver, causing the reproduced picture to tend toward a two-color rather than a true three-color picture. Because of these limitations, the preferable solution to improved picture quality is to asure that the transmitted signal represents the originally-intended values as faithfully as possible. At present, means for achieving such faithful transmissions are limited, hence the utility of the VIR signal.

Corrective Color Calisthenics

Despite all the advances in TV color receivers and broadcasting techniques, the only way the viewer can presently cope with color variations from one program segment to the next is to either obtain a set with the automatic color and tint conrols or keep adjusting the hue and saturation controls.

The TV broadcaster is confronted not only with changes in the phase of the color burst relative to picture information, but also with variations which may occur from a variety of signal sources such as program material from cameras, video tape recorders, film and film chains, signal processing amplifiers and keyed back-porch clamps. These equipments with wide ranging color values can produce color hues and saturation which can be distorted by any imperfection in the amplitude versus frequency characteristics or non-linear distortion such as differential gain of the complete TV system.

It is hoped that experiences with the use of the color reference signal in the vertical blanking interval will enable broadcast technicians to correct and reduce the errors in hue and saturation of the radiated TV signals, so as to achieve consistent color values.

For the first time a technician, by using the VIR signal technique, will be able to make observations from

*Harry Etkin died shortly after this article was written.

the variety of signal sources and, if necessary, make color correction adjustments of the phase and amplitude of the chrominance signal, sync and color burst and adjust the proper levels of the black reference.

In the presence of chrominance and luminance distortion it will provide the necessary information, all aimed at giving better color transmission of the existing program signal. In general, the VIR signal has been designed to provide a reference for luminance amplitude, black level, chrominance amplitude, and chrominance phase of the picture signal for a particular program rather than a transmission path. These reference signals can be used as a basis for making corrections to the video signals which would compensate for the distortions of the above named parameters.

TV broadcasters could make the necessary corrections by using the VIR signals to assure that the chrominance and luminance of the program signal has been adjusted to the same values as at the point of origin, at any part of the TV system, including the TV transmitter and the home TV receiver.

It is important to note the distinction between the VIR as a reference signal, in contrast to diagnostic signals such as the VIT (vertical interval test) signals intended to permit locating and correcting transmission faults and defects. To obtain optimum values from the VIR as a reference signal, maximum use should first be made of a test signal (such as the VIT) to assure the best possible system alignment. It must also be kept in mind that the VIR signal on Line 20 is intended to be treated and processed as picture while the VIT is treated and processed as part of the vertical interval.

VIR Signal Composition

The VIR signal as shown in Figure 1, placed on Line 20, is made up of the following reference parameters:

1. Subcarrier Phase Reference: A chrominance reference bar is shown in the first 24 microseconds. This consists of the chrominance subcarrier of the same phase as the color sync burst. It has an amplitude of 40 IRE units peak-to-peak and is set on a pedestal of 70 IRE units. The subcarrier phase reference will be used to correct the phase of the color burst so as to agree with the phase of the chrominance reference bar.

2. Subcarrier Amplitude Reference: The chrominance reference bar also provides a reference for chrominance subcarrier amplitude, When the luminance amplitude has been correctly adjusted, the chrominance subcarrier amplitude should be 40 IRE units peak-to-peak. This permits the saturation, and the amplitude of the color sync burst to be correctly adjusted.

3. Luminance Reference: There is a 12 microsecond luminance reference at 50 IRE units, which is followed by a black reference of 12 microseconds at 7.5 IRE units. These two reference levels can be used to correctly adjust the luminance amplitudes and set up.

It is apparent from Figure 1 that:

A. A small amount of signal compression will not affect the reference because the signal does not use the entire excursion from blanking to reference white.

B. The chrominance reference bar of the chrominance subcarrier is adjusted to the average luminance level of flesh tones and the amplitude approximates that of the color sync burst. With the reference bar set on a pedestal of 70 IRE units, corrective action to minimize nonlinear distortion will affect the most sensitive areas.

C. A quick check of the relative levels of luminance and chrominance could be achieved because the luminance reference and the level of the lower edge of the subcarrier reference bar are both set at 50 IRE units.

D. The 7.5 IRE units of the black reference provides for the normal setup level to be re-established.

E. Velocity errors in video tape recorders will have the least affect on the phase when the chrominance reference bar is placed at the beginning of the line as displayed in Figure 1.

Adding The VIR Signal

The proposed VIR signal is intended to be added to the program signal at a point in the video system where the correct amplitudes and phases are established and the artistic judgment is made that color reproduction is as desired. Once the VIR signal is added in this manner it will serve as a reference for the program signal.

As a standard procedure the BTS intends that the VIR signal be inserted at the output of the studio control room in which the program is originated and where all feeds for the particular programs will be adjusted for the desired color. Once this is done the VIR signal must be treated exactly as the video signal in all the equipments in the TV system.

Converting For VIR Signal Use

The proposed VIR signal will be placed and occur on Line 20 as illustrated in Figure 1. To permit the VIR signal to feed through the com-

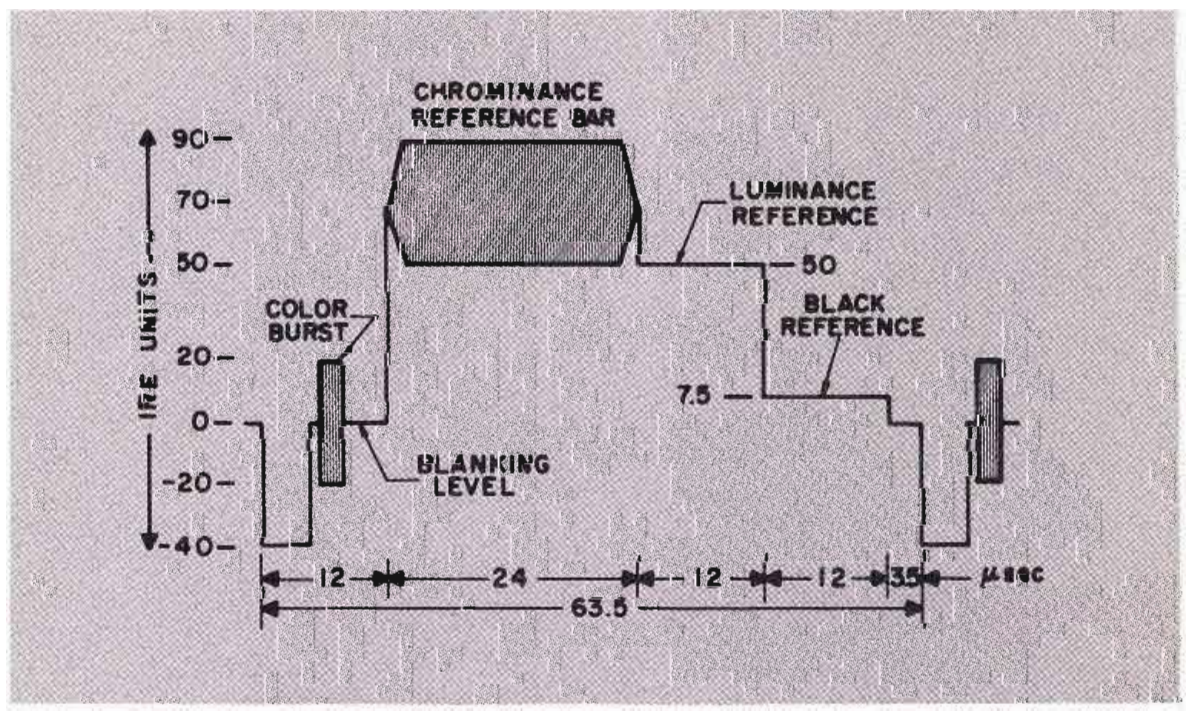


Fig. 1 The VIR signal on line 20.

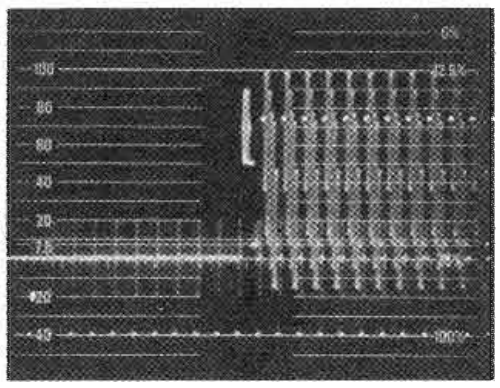


Fig. 2 The display that should be visible on waveform monitors. This display is using a magnification of 25.

plete TV station system it may be necesary to modify certain types of stabilizing amplifiers and signal processing amplifiers. This would also include those amplifiers which are installed in video tape recorders and presently treat Line 20 as part of the vertical blanking and not of the picture. These modifications can be made easily by the engineers and technicians.

The VIR signal may be observed on a waveform monitor, and amplitude and phase relationships measured using a vectorscope. Some instruments will require minor internal modifications to permit the selection and viewing of Line 20. In-monitoring the VIR signal the operator should note that the color burst phase and the phase of the chrominance reference in the instruments may fluctuate. This occurs because the relation between the chrominance subcarrier regenerator in the vectorscope and the color sync burst may change with the color burst amplitude. This instability should not invalidate the measurement of the color burst-to-chrominance reference phase errors. The use of dim CRT in the vectorscope may result in objectionable difficulties in the measurement of differential gain in the vertical interval as well as with respect to monitoring the VIR signal.

The VIR signals will permit TV station engineers to provide a means of setting the phase of the color burst to its correct value for the entire program. When the output from a tape recorder is modified and, if vertical aperture equalizers or color correctors are used in the circuit, it is important to ensure that the VIR signal is in its proper format at the output of the equipment so as to produce uniform transmissions at all times.

Phase Change And Amplitude Correction

Just what does the TV broadcaster expect to derive from using the VIR signal? The logical answer is that when the VIR signal is used at any point in the TV system the technician may see if the video signal is as it should be. Corrective technician may see if the video signal can only be accomplished at a position where the signal feeds through a stabilizing amplifier or other processing device which provides independent control of the phase and amplitude variables involved.

The output of the TV transmitter is the most important place to have a correct signal. In order to observe and measure this signal, a transmission-line demodulator must be used. It is important to remember that certain difficulties may result with some existing demodulators. If a demodulator has an upper sideband response which is flat to 3.6 MHz and also contains an envelope detector, then erroneous results may be obtained because of quadrature distortion effects.

During the extensive tests of the VIR signal, there will certainly be lengthy discussions, reviews, inquiries and familiarization with the signal for the development of the necessary procedures to implement the suggested corrective action. This is required to obtain information concerning the VIR signal usefulness, its shortcomings, and possible improvement. The committee would require cooperation of all the TV industry and the TV network affiliates.

VIR Signal Program Schedules

It will take at least a three-month period to complete the field tests. As there are only a limited number of VIR signal generators presently constructed and available, the VIR signal will only be used at prearranged time periods. This is not a complete schedule and the time period is EDT-EST and changes may be made at any time.

A typical program time period is as follows:

ABC

"One Life to Live", Monday-Friday, 3:30 PM-4:00 PM

"Lawrence Welk", Saturday, 8:30 PM-9:30 PM

CBS

"Love is a Many Splendored Thing", Monday-Friday, 2:00 PM-2:30 PM

"Family Affair", Thursday, 7:30 PM-8:00 PM

"Mission Impossible", Saturday, 7:30 PM-8:30 PM

NBC

"Today", Monday-Friday, 7:00 AM-9:00 AM

"Nightly News", Daily, 7:00 PM-7:30 PM

At the start the VIR signal will be used on Line 20 in one field on odd dates and both fields on even dates. After the first month the VIR signal will be on both fields.

Summing Up

If and when the field tests show definite successful results, the TV color broadcaster will be assured that, after making the necessary corrective adjustments to the chrominance and luminance of the TV signals at any point, including the output of the transmitter, the color signals will be uniform and have the same value as at the point of origin.

Due to the variable judgments and opinions made by different personnel and the operating characteristics of TV systems and equipments, it might be possible to design and make available automatic equipment for making the necessary adjustments.

The Committee intends to perform two short special tests after a reasonable length of time in field testing has progressed. These tests will be:

1. To make sure that the VIR signal is the same as the program signal from the point of insertion of the VIR signal to the selected location.

2. In conjunction with the TV receiver industry, to make subjective tests of any improvements in the receiver picture quality made by the VIR signal corrections. If this fact has been achieved, then future receiver circuitry may become less complex and more effective.

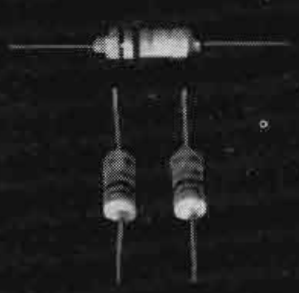
The author wishes to express his appreciation to the Electronic Industries Association (BTS) and especially to Eric M. Leyton, chairman of the Field Test Subcommittee of BTS Committee of the EIA for supplying the data and information to develop this article. ▲

AKG C-451E Microphone System

the common-sense approach to phantom powering.

Just one or two resistors! Simple, isn't it?

- No AC power supplies required
- No DC power supplies
- No "central" power supplies
- No special "cards"
- Operates off any DC voltage between 7.5 and 52v (including the standard 24v available in most equipment).
- Stabilizes its own operating voltage, to maintain constant output level.
- Optimum polarization voltage, for best signal-to-noise ratio.



MICROPHONES • HEADPHONES

DISTRIBUTED BY
NORTH AMERICAN PHILIPS CORPORATION
100 EAST 42nd STREET, NEW YORK, NEW YORK 10017

AKG CANADA • DIVISION OF DOUBLE DIAMOND ELECTRONICS • SCARBOROUGH, ONTARIO

AKG-130

THE SIMPLICITY OF SIMPLEXING

The AKG C-451E may be powered at the cost of one or two precision resistors: No separate AC or DC power supplies required nor special "cards" or "central" power supplies at additional cost.

The microphone preamplifier requires as little as 7.5v DC and may be operated directly off the *standard* 24v B+ supply available in your equipment (or any other voltage between 7.5 and 52v). The current consumption is only 2.8 mA.

Other features unique with the AKG system are:

A) Stabilized operating voltage: The DC supply voltage to the microphone is not required to be particularly well regulated nor is it rigidly tied to a specific voltage. In fact, it may vary by ± 15% since the C-451E preamplifier will stabilize the operating voltage. There is no limit to the number of microphones to be powered off your console.

B) Constant 60 volts polarization voltage: 60 volts is the optimum polarization voltage for highest performance standards, specifically sensitivity; resulting in more gain without increase in noise level and better signal-to-noise ratio. The C-451E supply voltage is not simultaneously the polarization voltage (too low). The microphone preamplifier provides a constant 60 volts polarization voltage and fluctuation in the supply voltage will not change the output level of the microphone.

There are no short cuts in the AKG C-451E circuitry!

HOW DOES IT SOUND?

Interestingly enough, its pick-up characteristics are being compared to the quality previously obtained only with large diaphragm condenser microphones.

The newly developed CK-1 capsule incorporates a metallic alloy diaphragm (similar to the diaphragm material used in measuring microphones) and is absolutely smooth between 30-18,000 Hz with unequaled transient response characteristics and wide dynamic range.

The polar pattern is a true cardioid at all frequencies with linear off-axis acceptance and a front-to-back discrimination of 20-30 dB over the entire range.

Last, but not least, a practical and economic modular design permits you to choose from a variety of interchangeable capsules with different response characteristics and polar pattern (cardioid, omni-directional, figure-eight and shot gun tube).

AKG OFFERS A CHOICE— NOT A STANDARD

Write for complete technical data.

Circle Number 18 on Reader Reply Card

Apparent Liability

The FCC Expects You To Know

A review of positions taken by the Commission in cases of apparent liability, an important consideration at renewal time.

By Ray Dordal*

A "pink ticket" may bring a blue Monday to any operator, but a "Notice of Apparent Liability" from the Federal Communications Commission in Washington, D.C. may mean serious trouble for the licensee of a broadcast station.

Penalties range up to $10,000 and may lead to a short term renewal of license, or eventual revocation. And it makes some difference whether the violation of the rules which prompts the notice is "willful and deliberate" or simply inadvertent and unintentional. But not much.

Enforcement officials within the Broadcast Bureau take a dim view of any violations or discrepancies concerning the rules and regulations of the Federal Communications Commission, based on the Communications Act of 1934 and subsequent amendments over the years.

Ignorance of the rules on the part of licensee, permittee or operator is not excusable from a Commission viewpoint. This attitude was emphasized in a letter to one station:

"Licensees are expected to know and comply with the rules and regulations and will not be excused for violations thereof, absent clear mitigating circumstances."

To another complainant against forfeiture the Commission answered: "Amendments are a matter of public record and licensees are required to keep abreast of and to comply with changes in the regulations."

To quote further: "Any violation of the rules reflects upon a licensee's qualifications in ratio to the seriousness of the violation, its duration and other relevant circumstances." The Commission did add a qualification: it "does not consider isolated violations of certain kinds and duration as a reflection on the basic character qualifications of a licensee." But for other violations it does.

Whether the offense is committed with or without the knowledge of the licensee himself makes little difference. The Commission has "consistently held in the past that licensees are responsible for the acts of their employees . . . and will not be excused for violations of the Rules absent of clear mitigating circumstances." The operator's certification, based on the performance of his duties, may be scrutinized by the Field Engineer's Office, but it is the licensee or management which must answer to the Commission for any alleged violation.

Why does the Commission insist on strict compliance?

The total number of broadcast stations "on the air" passed the 7800 mark last month. Included in this total were 900 television stations, about 2600 on FM radio frequencies and over 4300 in the standard broadcast band. The figures include both commercial and educational operations.

Growing Complaints

This complex of broadcast stations raised the shackles of a number of listeners. A total of 60,295 complaints, comments and inquiries reached the desks of Commission employees in the Complaints and Compliance Division of the Broadcast Bureau within the past year. This mass of letters, telegrams and personal complaints was handled by a relatively small staff of Commission employees. The 25,920 complaints included in those contacts were almost entirely confined to non-technical matters. Such varied subjects were included as questionable programming, distortion or suppression of news, obscenity, profanity, indecency and varied advertising practices. Of course, in an election year terminating with the balloting last November 3, heavy mail related to Section 315 of the Communications Act and the Fairness Doctrine.

As for the technical end, within the standard broadcast spectrum, the same Complaints Division handled hundreds of violations, the total of which the Division has been too busy to tally or categorize. Many technical offenses were handled entirely within each of the 24 District Offices of the Field Engineering Bureau at various locations throughout the United States, and in Alaska, Hawaii and Puerto Rico.

Action on those violations which did come to the attention of the Complaints Division and which were serious enough to refer to the Commissioners have been reported in numerous press releases issued daily from the Washington office. The amount of the forfeitures in many instances indicated the relative seriousness of the offense, although the Complaints Branch emphasizes that the financial condition of the station is always considered, as well as the nature of the violation, in determining the extent of apparent liability.

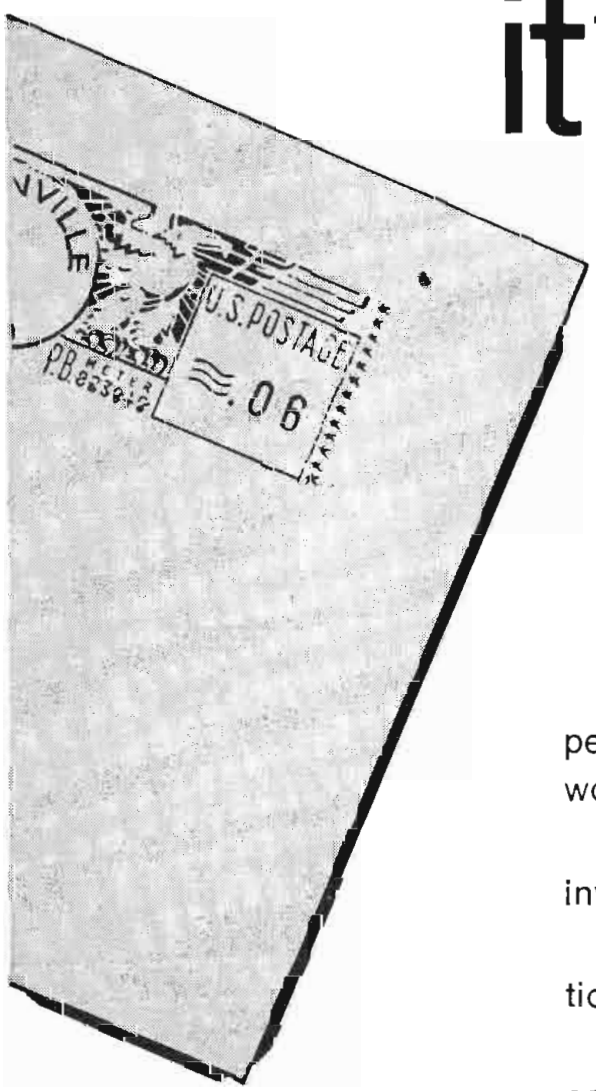
A station in Ohio misunderstood the requirement for inspections and was asked to forfeit $200. A Georgia operation was cited for failing to keep the required maintenance logs and was assessed $500. A licensee in Texas was charged with sixteen violations for failing to replace improperly functioning tower lights (and for other offenses) and was notified of a $3,500 liability.

Many Notices for lesser forfeitures were directed to licensees for failure to use qualified operators in making daily inspections; for making improper entries in the log; and for failure to make the required equipment performance measurements. Alleged falsification of log entries drew sizeable requests for forfeiture.

But the maximum penalties of

*A. D. Ring & Associates, Consulting Radio Engineers, Washington, D.C.

Shouldn't your business get what it's paying for, too?



No matter how much your business uses and depends on mail service, you're not getting your money's worth...unless you use ZIP Code.

It doesn't matter whether you're sending out an invoice. Estimate. Announcement. Brochure. Or what.

A ZIP Coded letter requires fewer sorting operations at your local Post Office.

Which means it has a better chance of getting out earlier.

And into your customer's hands sooner. (Even if he lives in the same town.)

Can you think of a better deal for three seconds of your time?

Mail moves the country – ZIP CODE moves the mail!

advertising contributed for the public good

$10,000 (authorized in Title V of the Act) occurred, in part, for violations of the FCC regulations relating to presunrise service authorizations.

Not all the penalties for these offenses were heavy: a station in the State of Washington drew a light fine of $750. Two stations in New York were charged $1000 apiece. Another station in Vermont was likewise fined $1000 but later secured remission of the penalty.

Presunrise Violations

However, maximum penalties of $10,000 for presunrise violations were directed against stations located in Kentucky, Louisiana, South Carolina and Texas. In some cases these heavy assessments were charged for "willful and repeated violations of Section 73.73." This section of the rules reads: "If the license of a station specifies the hours of operation, the schedule so specified shall be adhered to except as provided in Sections 73.71 and 73.72."

Section 73.99, relating to Presunrise Service Authority begins with the words which indicate, perhaps, why the Commission considers strict regulation of PSA operators mandatory: . . . "in order to afford . . . maximum uniformity in early morning operations compatible with interference considerations . . ." Therefore, when "pursuant to Section 73.99, (broadcast station licensees are) "granted Presunrise service authority from 6 AM or sunrise at given station, whichever is later, to sunrise times specified in the instrument of authorization, with daytime antenna system and with power as shown" the licensee is expected to adhere rigidly to these specifications.

One station in Florida was cited for operating with daytime facilities prior to sunrise time and the requested forfeiture was $5000. The station replied that it had never received notification of the rule change prohibiting such operation, and that it had taken immediate action to correct the situation. The Commission reiterated: "corrective action subsequent to notification of a violation will not relieve licensees of liability."

The change twice yearly from daylight saving to standard time and back again have caused considerable conflict between regulatory agencies and licensees. Pleas of ignorance of the changes or unfamiliarity with the procedures usually fall on deaf ears, although when several stations in Florida were assessed penalties ranging up to $5000 for these types of violations, in at least one case the plea for mitigation was heeded and the fine was substantially reduced.

Ignoring The Notice

The ire of the Commission seems to fall hard on those licensees who ignore notifications, fail to reply to letters and telegrams, and generally disregard Commssion directives. The Commission, however, is merely applying Section 1.621 of the Act which provides, in part, that if a licensee fails to take any action in respect to a notification, an order shall be entered making the forfeiture final.

After the Official Notice has been received by the licensee, a 30-day "period of grace" is given within which the station may pay or contest the forfeiture. He may request a mitigation of the penalty by asking for a reduced fine, or may ask for remission of the entire amount. Even though the financial condition of the station was carefully considered in initial Notices, some stations are enabled to pay a lesser amount, or nothing at all, by successfully supporting a plea of ignorance, or financial hardship, or even subsequent destruction of a station by fire.

Perhaps the licensee decides, after a request for mitigation or remission has been denied and the other of forfeiture reaffirmed, that he will not pay the required amount into the Treasury of the United States.

The matter is referred to the Department of Justice. The Attorney General of the United States alerts the district attorney within the judicial district in which the station is located. A civil suit is filed and further judgments must be made by a court of competent jurisdiction. The matter is out of the hands of the Commission.

Worse, from the viewpoint of the licensee, is the action the Commission may take upon an application for renewal of license. The Commission may decide that only a short term license renewal should be granted, to determine whether or not the "public interest would be served by further renewal of the license." Perhaps the violation has been so serious in official eyes that it reflects upon the licensee's qualification to continue as a broadcaster. In any event, no station management relishes the prospect of leaving the air waves for "willful and deliberate" disregard for the rules.

The statute of limitations of one year applies, for the violation must have occurred within the year prior to the date of the Official Notice.

Initiating The Notice

How does the Commission originally find out about the violations which they Notify? The Complaints Branch indicated that there are three principal sources of information.

Competitors on the frequency may suspect violations because of prohibitive interference, sparked sometimes by complaints from listeners on the periphery of the service area. The Commission maintains a Field Office Division which includes an inspection and measurement branch, and periodic inspections may note other violations. A monitoring system likewise reports alleged violations which may require punitive action, based on comparisons of monitoring tapes with entries in the log.

Noting the increasing number of technical violations at broadcast stations, the Commission said one of its most important considerations is whether the number of violations and discrepancies would be increased if the rules were relaxed. The Commission is considering such relaxation of operator requirements for both AM and FM radio broadcast stations. A Notice of Proposed Rule Making was adopted in July of 1970 which may lead to use of third-class operators for routine activities.

Continuing changes in the rules and regulations require constant alertness on the part of operator and licensee alike to avoid involvement in a "Notice of Apparent Liability."

The Commission

Use of the term "The Commission" fails to personalize the men whose responsibility it is to finalize actions against violators and to vote mitigation or remission when advisable.

Dean Burch is the chairman of the Commission, appointed last year by President Nixon. Robert T. Bartley is a Texan who has served as a Commissioner since 1952. Robert E. Lee was first appointed Commissioner in 1953 following service in the FBI.

Nicholas Johnson, an Iowan, received his appointment in 1966 from President Johnson, as did H. Rex Lee, from Idaho, appointed in 1968. Robert Wells, a former broadcast station announcer, was sworn in during 1969.

A vacancy on the Commission created by the expiration of the appointment of Kenneth Cox remains to be filled.

Within the Commission's Broadcast Bureau, the chief of the Complaints and Compliance Division is William Ray, former radio station licensee in Iowa. Arthur Ginsberg, a long-term attorney with the Commission, is chief of the Complaints Branch, while the newly appointed John McAllister, from Minnesota, is chief of the Compliance Branch.

Curtis B. Plummer is chief of the Field Engineering Bureau. J. Patrick Scanlon is chief of the Field Office Division within this bureau, and Ivan T. Lorenaen heads the Monitoring Systems Division.

Each of the 24 District Offices within the Field Engineering Bureau is headed by an Engineer-in-charge. ▲

Editor's Note: The stance that some licensees take on fines is that they are strictly engineering-caused problems. But the FCC does not make such a distinction. The management side of the station cannot be excused for not knowing the Rules under which the station must operate. It is important that management and engineering understand the attitude of the Commission.

If both management and engineering made simultaneous checks (according to the check list we ran in the December, 1970 issue of BE), both sides would better understand what the inspectors are looking for. And it might help to bridge the gap. Management might better understand that engineering demands are based on Federal Rules, and engineering might feel that management is concerned about the technical operation of the station in other than panic periods.

Can we bridge the gap between Management and Engineering?

Part 1 of a 2-part series

R. H. Coddington*

The "generation gap", as an issue of mounting national concern, is but a recent phenomenon. In the specialized fraternity of broadcasting, though, there traditionally has been a "philosophy gap" between the managerial and the technical segments.

In the half century since the early experimental radio operations went commercial, the divergence has grown and festered. Recent proposals by the National Association of Broadcasters to relax certain FCC operator requirements for radio stations have inflamed the old wound anew. Management claims that the present rules are onerous and unnecessary; engineers contend that technical standards (and their jobs) would suffer if the rules are relaxed. Is there no middle ground, where rational members of both sides can meet and function in a mutually beneficial coexistence—if not in full harmony?

There is a basic difference in the philosophies embraced by "typical" managers and "typical" engineers. I have concluded this from 22 years in radio and TV; years in which I've had a varied experience on both sides of the "gap".

It's true that many broadcasters wear both hats with distinction, and any individual—be he manager or engineer—will not fit precisely into a generalized mold, of course. However, if that common ground of coexistence is to be found, it first is necessary to **understand** the fellow on the other side of conference table a little better. It is toward this end that I indulge in generalizations that may be helpful in leading managers and engineers a step beyond the confines of their respective philosophies.

*Richmond, Virginia. Author of **Modern Radio Broadcasting-Management & Operation In Small To Medium Markets.**

What Is An Engineer?

The dedicated broadcast engineer is likely to be somewhat of an idealist. Perhaps it is because of this that he often is more at home with **things** than he is with **persons.** In the world of invisible electrons by the billions, he finds a statistical cause-and-effect predictability that's lacking in the "real" world of individual human beings.

Coupled with the engineer's idealism is a strong curiosity and a creative urge. These traits may be active within a relatively narrow area. For example, he may be interested principally in, say, audio equipment. Or in the radio-frequency functions of the system. Or perhaps, in TV, the video circuitry is his first love. Apart from his natural domain of achievement, he may view the broadcast-related technical fields with relative disinterest.

Because of his underlying idealism, the broadcast engineer is not satisfied with a system that merely works; it must work at its **best**—as close to perfection as its design and the state of the art permit. This translates into professional pride. If he has available neither the time or the funds to install and maintain a broadcast system that meets his concept of professionalism, his frustrated idealism breeds dissatisfaction.

Classically, the engineer feels—with some justification—that his contribution to an operation's success isn't fully appreciated in the front office. It's the program personnel who are in the public eye, and it's the sales people whom management most appreciates, or so it sometimes seems.

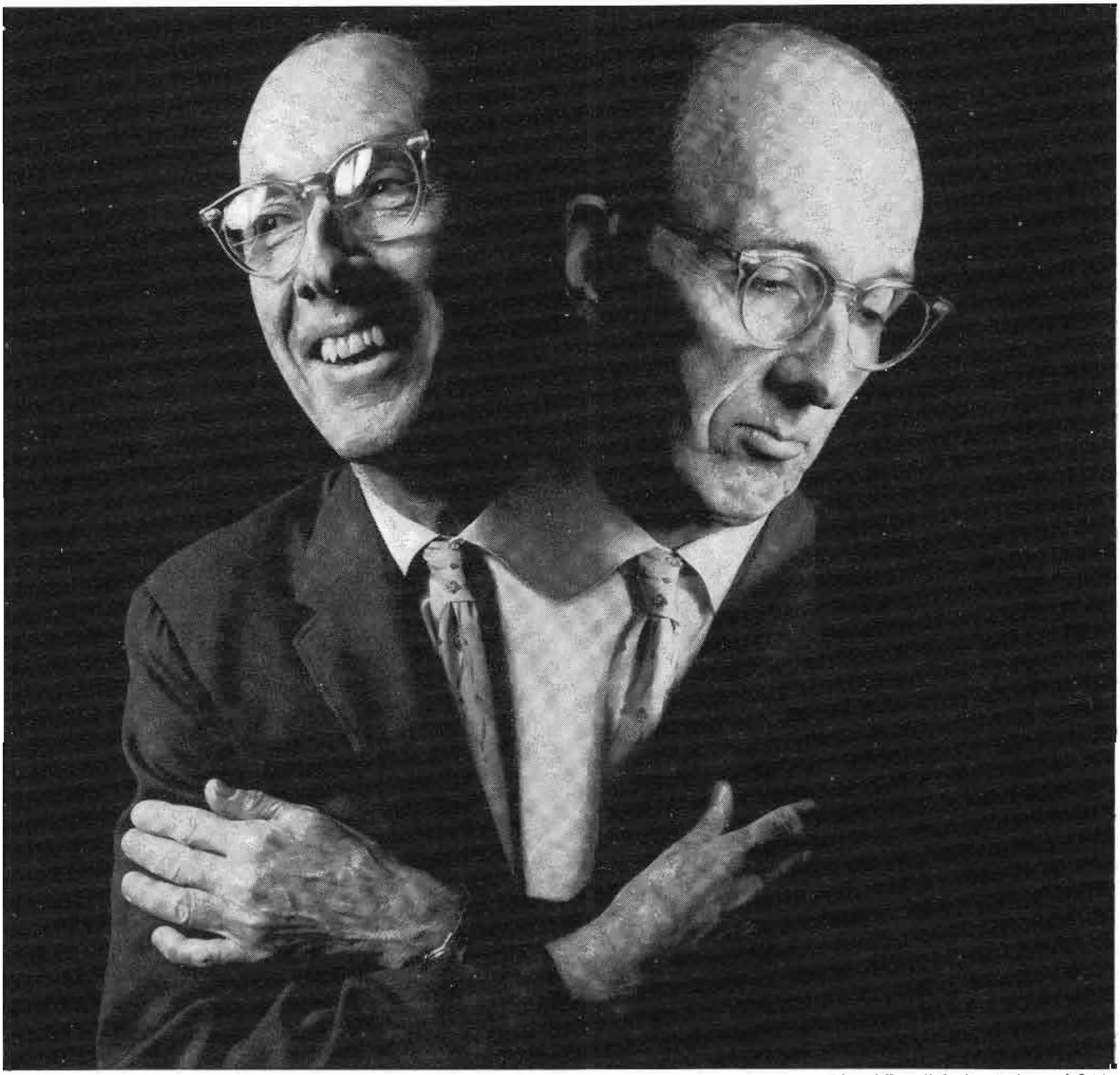
The engineer comes to mind, though, when there is technical trouble, and the more proficient he is at forestalling failure, the less frequently he is called upon. It **is** easy for management and production people to overlook the expert engineer's vital importance to the facility that gives them a voice to sell!

Motivation

Generally, the broadcast engineer is motivated by more than money. His principal satisfaction lies in the opportunity to pursue his interests professionally with professional equipment, and to enjoy some sense of achievement. Too, he probably has some fascination with broadcasting as such, or he would have sought other technical fields having more conventional hours and better retirement plans.

Money **is** important to him, of course. He must have enough to live, and he likes to indulge himself in hobbies when he can afford them. Since he must have considerable specialized knowledge, must work odd shifts, and is directly

THE RECORD LOVERHATER



Edward Tatnall Canby, Author and Critic

The job of the music critic isn't easy. He can help a record make it to the top or damn it to oblivion.

And since many people depend on his judgment when they shop for records, it's logical to ask:

"But what does he depend on?"

Mostly, his ears and his knowledge help him as he listens. Yet the music critic can only hear what his stereo system delivers. If his critical listening is to be unbiased, it must begin with a stereo cartridge whose frequency response characteristics are as flat as possible. One that introduces no extraneous coloration as it reproduces recorded material.

Many record critics do their auditioning with the Stanton 681EE. Recording engineers have long used the Stanton 681A to check recording channel calibration. The 681EE provides that logical continuation of the Stanton Calibration Concept. It has been designed for low-distortion tracking with minimum stylus force. Its low-mass, moving magnetic system produces virtually straight-line frequency response across the entire audio spectrum. Its built-in longhair brush keeps the stylus dust-free, and protects record grooves, thus reducing noise and wear. Each 681EE is individually calibrated, and the results of these calibration tests are included with each cartridge.

The Stanton 681EE—used by recording engineers, broadcasters, critics and audio professionals—the cartridge that sounds like the record sounds, always.

For further information, write: Stanton Magnetics, Inc., Terminal Drive, Plainview, N.Y. 11803.

STANTON

Circle Number 21 on Reader Reply Card

responsible for distribution of the station's only product, the broadcast engineer feels that he should command a respectable income.

With his appreciation of things done the "right" way, the engineer may become trapped in his professionalism. Improved performance and reliability of equipment may fully justify its operation unattended by a human nursemaid—but the engineer may be prone to protest this apparent diminution of his importance. It is then that he looks toward his FCC license as some guarantee of security, which of course it is not.

This in turn introduces an emotional factor that clouds the objectivity necessary to an engineer's thought processes, and he becomes as unreasonable as any paycheck-motivated laborer. He may even become more so, since the engineer is confident that he surpasses management in the understanding of technical needs. While this confidence is justified in most operations, it doesn't validate a position that is influenced by emotional factors.

The "90-Day Wonder"—the FCC First 'Phone ticket holder who passed the exam after a few weeks of intensive memorization—insults the broadcast engineer's professional pride. The insult is two-pronged. First, the engineer recognizes that the significance of his own identical document is diminished by association. Secondly, he genuinely dreads the technical performance of those whose only interest in a license is as an adjunct to their principal qualifications. The dedicated broadcast engineer respects professional equipment and its optimum performance, and he considers the "90-Day Wonder" inimical to both.

In general, the engineer is intelligent, self-motivated and responsible —but he is not a machine. He's human; he seeks a variety of job satisfactions; and he's not 100 percent objective, any more than are you and I.

What Is A Manager?

This classification requires even broader generalizations, and therefore produces more exceptions. It's safe to say, though, that a manager is a salesman. In the great majority of broadcast operations, the only path to management is via the sales department. The doubtful wisdom of this custom doesn't change the statistical facts.

The "typical" manager, therefore, closely resembles in makeup the "typical" salesman. This means that he is most at home in dealing with persons, not things; his mechanical aptitude may be quite limited. It is in the give-and-take process of working with people that he finds his challenges and his satisfactions. The possibility that an engineer might prefer an evening spent building a "ham" transmitter to a convivial social gathering may be beyond the salesman's understanding.

The fact that he deals with persons marks the salesman/manager with one basic, vitally important difference from his technical coworker: he is a pragmatist. Idealism, when dealing with people, is an obstacle that he can ill-afford. There is no place in his working world for gilding the lily; obtaining the lily itself is his prime objective. In other words, he may assign little importance to the effort required to refine the performance of an item of equipment that already works passably well. A marginal further step toward perfection may impress him as an insignificant return on a substantial investment of effort.

Which leads into another characteristic of the typical salesman/manager: he is profit-oriented. This is not said in a derogatory sense; our economy is geared to the profit motive, and salesmen are its catalysts. But being profit-oriented, and dealing largely in non-material personal relationships, the salesman is prone to measure his success by the tangible yardstick of money.

Herein lies the reason for the accession by station managers from the ranks of salesmen: station **ownership** is profit-minded, too. The successful salesman naturally seems the most promising candidate for profitable management.

(In my opinion, station ownership and management should be motivated by more than mere profit; while profit is just and necessary to our U. S. broadcasting system, a mass medium with the power of broadcasting is judged by more than its profit-and-loss statement. Nevertheless, it must be told "like it is": managers **are** groomed primarily to produce profits.)

The manager, then, being pragmatic and profit-oriented, views the engineer as an operating expense. When the engineer is visibly engaged in keeping a signal on the air—repairing a breakdown, or installing or renovating equipment—the manager sees him to be productive. However, if the plant seems to function passable with a minimum of active technical attention, he may feel that the limited demands on the engineer's time don't justify his cost. The fact that the idealistic engineer well may be occupied in seeking **optimum** performance is lost on the pragmatic manager, who feels that the cost of anything beyond adequate operation is unjustifiable. This demonstrates how men of divergent motivations may come to the point of conflict.

One Situation; Two Views

The "philosophy gap" permeates all of broadcasting. However, the vital need for engineers presently is much more evident in TV than in radio, so that the schism surfaces more often and more bitterly in the aural medium. My comments here are concerned principally with the problem as it concerns radio.

Consider the case of Fred C. With a sound technical education and a quarter-century as a broadcast engineer, he is a professional. For most

of his weekly 40 hours, he stands watch at the transmitter plant of a major AM-FM operation. When there, he is directly responsible for two 50-kilowatt AM transmitters and one 20-kilowatt FM. He also oversees the directional AM antenna system, full automation of the FM audio, and a standby diesel generator capable of supplying the entire plant. He thus is responsible for equipment worth something in the neighborhood of a half-million dollars, to say nothing of the value of the signal itself.

The basic plant was built in the grand powerhouse manner some 40 years ago, and it embodies a high degree of professionalism throughout. Despite the 24-hour operation, the technical staff keeps the equipment well maintained and relatively trouble-free. Barring electrical storms, the operating shift places very small demands on Fred. He has ample time to read, study, or perhaps just daydream. He only has to keep logs, to occasionally re-load the automation equipment, and of course to exercise his experience and ability in the event of equipment failure. Also, he may perform those maintenance and construction chores that can be done without interfering with the transmissions.

For this, Fred is paid only modestly well by today's standards. Over the years with this operation, he has received increases from time to time as his longevity accumulated and as general pay scales rose. His **rate** of increase, though, has not paralleled that on the "outside". Today there are truck-driver neighbors who regularly earn more on less education, less experience, and generally less responsbility.

The station today is prosperous; is it unreasonable for its engineers to desire pay scales that are commensurate with today's living costs? Is it really necessary for some of Fred's fellow-technicians to supplement their incomes with side occupations? There are two sides to this question.

The Engineer's View

The full-time radio broadcast engineer must be able to make a living. Possessing technical skills and official certification, he feels that he is "renting" his expertise more than his actual active performance. If there are idle periods during his working hours, his presence still is needed not only by legal requirement, but also as insurance against prolonged signal outage. Each hour, in his eyes, should merit a skilled workman's pay, since he is unable to apply his talents gainfully elsewhere during that hour. He further believes that a well-run (and well-engineered) radio station should be **able** to pay his skilled rates without plunging into bankruptcy.

The engineer probably works unorthodox hours, holidays and all. In a small operation, he is likely to be "on call" during his off-duty hours —and asked to fill in with non-technical functions when he is on duty. And if he is dedicated, he may spend much of his own time in the invisible mental processes of planning equipment improvements and innovations. Whatever may be the nature of his operation, the engineer knows that there's more to his job than meets management's eye.

Management's View

Management views personnel in terms of visible productivity, with the expectation of showing a profit on it. If an employee costs **x** dollars an hour, he should contribute **x + y** dollars to the hourly value of the company's product. It is next to impossible, however, for management to imagine that an engineer produces **x + y** dollars during an hour when he does virtually nothing but make log entries each 30 minutes. (The same could be said for announcers in earlier days, who often did nothing more than chain-breaks each half hour.)

In the small, one-engineer operation, management can see that nominally reliable plant operation does not require 40 hours of weekly maintenance. The engineer who busies himself full-time at "whatever it is that engineers do" appears to be of limited productivity much of the time; yet he may balk at suggestions to diversitfy into non-technical duties.

The apparent unproductivity of engineers has been compounded by vast improvement over the years of equipment reliability. As the need for continual adjustment and repair has diminished, the attendant engineer has appeared progressively less productive. However, since he **is** on duty, he must be paid—but only enough to more or less "average" his alternating periods of productivity and non-productivity. Regulations requiring an attendant operator now seem to management to be an artificial obstacle to the traditional law of labor supply and demand, and there has been great resistance to the inflationary technical wage spiral fed by "outside" industry, even though radio profits in general have climbed apace.

The result has been to discourage technicians who might otherwise gravitate to broadcasting. Thus broadcasters complain that they "can't find" engineers. In truth, the engineers are around, but they must work at jobs where they can be productive enough to justify commensurate income. Today, radio generally fails to offer this, and TV pay is not significantly greater.

In the next part of this series, we will focus on ways to bridge the gap. In any case, it must be understood that the author is forced by the complexity of the "gap" to give us generalizations. He does not dwell, either, at the extremes where we have management refusing to technically update equipment and the bench or engineers who cause more problems than they solve.

As always, we invite your letters to the editor on this and other subjects covered in Broadcast Engineering. The Editor

▲

1970 NAEB Convention

The non-commercial challenge

The use of the electronic media in education is growing. At NAEB convention time, the count looked something like this: AM—25 stations; FM—448; TV—204 stations. And this says nothing for the growth in CCTV and ITFS systems. But it doesn't end there. Audio visual departments are hard pressed to keep up with the surge toward video tape.

What does all this growth mean?

For openers, it means that more engineering talent is needed to install, maintain, and interpret the equipment potential to managament and production. For management, it is an opportunity to open up new vistas for education within and without the classroom. And for production and management, it means added responsibility, because having a highly sophisticated technical layout will not automatically insure viewer-listener interest, and the audience is growing.

Furthermore, it complicates the efforts of a national organ, such as the National Association of Educational Broadcasters, because in the electronic sense, many NAEB members do not broadcast signals. Instead, they distribute. And it is this distinction that opens the door on the halls of delegates who call themselves public, non-commercial, educational, and instructional broadcasters . . . In other words, increasing greater demands will be made to (1) keep pace with the state-of-the-art, and (2) to program diversity into the national association in such a way that it challenges the membership to reckon with the onrushing technology on the plaines of public responsibility.

With this evaluation in mind, let's see what the NAEB did during their November convention to awaken and challenge the giant we usually refer to as educational broadcasting.

NAEB President Harley—"Every educational radio and television facility must be educational, public and community oriented."

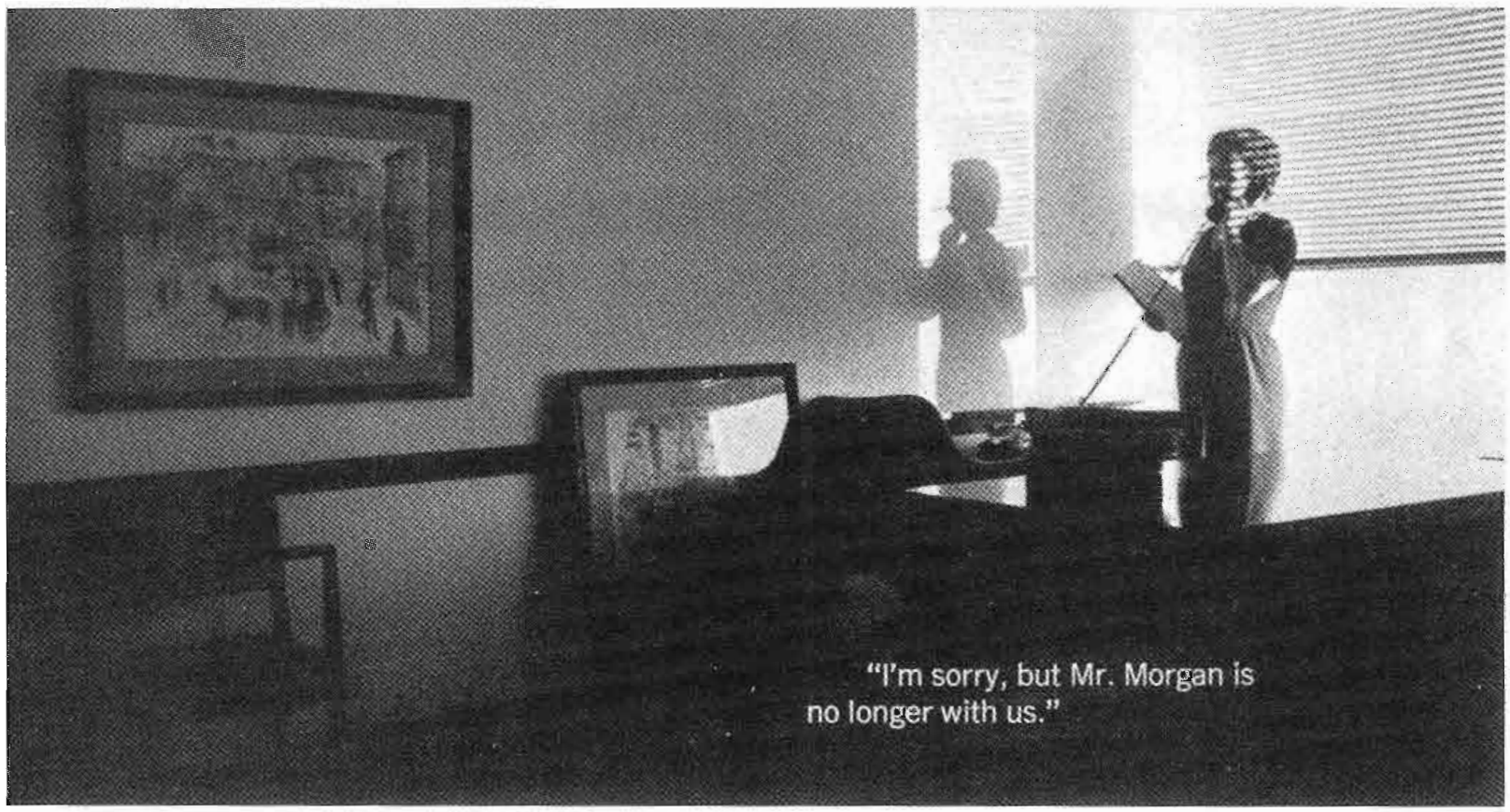
NAEB President Harley Sets Stage For 1970's

The need for strong, local community-based programming in public broadcasting, the crucial role that educational broadcasters must play in the educational structure of American life and his ability to adapt efficiently to change were stressed by William G. Harley in his keynote address.

Harley warned that if "distasteful realities are what community involvement yields then that is the arena in which we must operate." He emphasized that educational broadcasting can be a major instrument for the people's participation in the conduct of their affairs. "Such participation can range all the way from the intitial efforts to understanding problems, trends and issues through efforts to identify and define alternative approaches and solutions," Harley said. "Every educational radio and television facility must be educational, public and community-oriented.

"To expect less of ourselves is unprofessional. To do less is to fail."

Harley urged that there be an end to national commissions, task forces, or study panels on instructional television, instructional radio or any other related topic. Rather, he said, those in national positions should encourage the kind of effective activity now being demonstrated in isolated instances, and the development of local, metropolitan, state and regional inquiries into the kind of communications systems that should be established to facilitate educational development and reform. This is where the action is, it is where the taxpayers are, and it's where the broadcaster must be, with the most carefully planned, well evaluated, most superior programming that educational broadcasting



He left the company. For good. Like 25,000 other valuable employees who lost their lives last year in auto accidents.

Which has prompted a lot of businesses to set up the National Safety Council's Defensive Driving Course. A course that utilizes tested concepts and techniques of defensive driving that can dramatically reduce traffic accidents among your employees.

Western Electric has already trained hundreds of its employees how to drive and survive. So have other employee-conscious businesses like National Cash Register. Oklahoma Gas and Electric. And the Hartford Insurance Group.

You, too, will find it very profitable to set up your own Defensive Driving Course for your employees.

Because the best way to keep your workers working is to keep your workers alive.

Send for the survival course.

Special Projects—Public Information
National Safety Council
425 N. Michigan Ave.,
Chicago, Illinois 60611

advertising contributed for the public good.

Please mail me full details on the Defensive Driving Program.

Name_____

Title_____

Firm Name_____

Address_____

City_____ State_____ Zip_____

can develop.

He added that massive use of communications technology in education is required if educators are to be effective in managing change economically and on a large scale.

"Increasingly, educational broadcasting stations, along with nonbroadcast systems and other education agencies, will need to move toward the establishment of communication centers to provide a suitable base for managing the use of present radio and television facilities and other telecommunications systems. Accordingly, we must devise ways of employing microwave and cable systems as major modes for distribution, of embracing new cartridge systems and computer systems, and of using satellites for interconnection."

Harley admonished delegates to use their freedom with responsibility. In this regard, Harley said "the test for you becomes not how somebody or some group defines responsibility but whether in actual fact you are serving the people's right to know."

It should be understood that presenting the vital local scene would make the FCC and the viewer happy . . . so long as the programming is on target. And it should be a happy note for equipment manufacturers as well. Obviously, it will require additional equipment to cover the local scene.

FCC Chairman Dean Burch

No one at the convention really thought FCC chairman Dean Burch would drop any bombs. He didn't either. What he did do was to remind his audience that (even without Cox) the Commission has the best interests of educational broadcasting near the top of its lists.

Burch cited the CATV commercial substitution plan which calls for a payment to public broadcasting and calls for comments on whether or not the payment should be equally divided between the Corporation and local stations. Burch, then, joined the long line of advocates for a more permanent educational broadcasting financing plan. But, he added, "We at the FCC can only propose, not dispose."

Burch went on to say that the FCC would not take the route of securing greater ETV financing by making ETV more commercial. . . by permitting greater backing from commercial sponsors. "The whole point," he said, "is that you are noncommercial . . . that your efforts are not tied to commercial sponsorship, with all the consequences."

"So I say to you," Burch summed up, "do not strive to compete with the commercial broadcasting for the maximum audience. Do your own thing. Don't play a numbers game."

Macy Calls For Federal Financing

John W. Macy, Jr. warned that the growth of public broadcasting may be permanently stunted unless a method of adequate, long-range federal financing is arranged within the next two years.

Macy, president of the Corporation for Public Broadcasting, stressed the urgency of the issue by pointing out that key congressmen have gone on record as refusing further annual appropriations for CPB beyond fiscal 1972.

CPB was authorized by Congress in 1967 to strengthen the system of public radio and television. In fiscal 1970, $15 million of its $16.4 million budget came from the federal government.

Macy noted that the Carnegie Commission on Educational Television, many of whose recommendations were adopted when Congress authorized CPB, had stated that be-

FCC follows NAEB petition

In response to a petition by the National Association of Educational Broadcasters (NAEB), the FCC has modified its rules to permit hourly identification of program suppliers, has authorized some additional identification if needed to identify the source of a program, and has limited the effectiveness of the new rules to programs completed after January 1, 1971. Present arrangements may continue to the end of the year.

The Commission also provided that the rules on identification do not apply to auctions of commercial products produced by educational stations as a means of raising additional operating funds. At the same time, however, the Commission limited such identification to the auction itself and questioned the public interest aspects of auctions. It said that these practices were closely related to regular advertising and that when other means of ETV financing became available it intended to reexamine the practice to determine if auctions should be permitted in their present form.

The entire matter of identification of program sources and funds was also questioned by the Commission. It said that the practice could lead to "undue channelling" of educational broadcast time and effort into certain areas because they are likely to attract such support. It said that this may duplicae commercial programming to some extent.

The Commission said it would study trends in this area carefully to determine whether any further restrictions would be required. It noted also that it would not be "disposed" to consider any additional requests for further liberalization of credit requirements.

tween $100 and $200 million a year would be required to lift the system above the subsistence level.

He conceded that attaining this financing would be rough going. "But," he said, "the time has come for public broadcasting to free itself from tangled and diminutive purse strings. If we are to provide maximum service to the American people, we must have the material resources at an assured and adequate level."

Macy noted that in the past year public broadcasting had improved its programming, its national program delivery system and the size of its audience.

Regarding the latter, he announced that the weekly audience of public TV had increased 37 percent in the last year, according to a recently completed national survey by Louis Harris & Associates. The survey showed that some 33 million persons watch public television each week, up from 24 million in 1969. "But what we have accomplished," he said, "while dramatic, pales when we consider what public broadcasting can do in the future, if financial resources were assured at a level that would permit the freedom to research, plan, produce and transmit programs of public interest."

With long-range financing, he said, exciting innovations would be possible. Taking "Sesame Street" as a model, and using new methods of dissemination such as cable and video-cassettes, new ways of teaching could be developed and could be used in such fields as vocational education and higher education at home.

Increased funds could make possible high-quality presentations, with broadcasting perhaps producing its own "Civilization" on American culture. Expanded involvement in public affairs would also be possible.

"We in public broadcasting know our responsibility for promoting the democratic process in this trying time," Macy said. "We do our best to meet it. And if we were not so often perched on the edge of debt, we would demonstrate that the electronic media—now characterized in politics chiefly by the 'big smile, hi-folks!' 30-second spot—are capable of bringing near to fruition the rational exposure of candidates and issues that has long been our American ideal."

"What prevents this from happening now," he said, is "not a lack of will or desire for a low profile . . . but rather hard cash."

EDUCOM Scholarship Continued

Denver Ray James won the Visual Electronics annual EDUCOM award and scholarship. That was no surprise. It was announced in the Educational Broadcasting column of the November issue of BE. But it was a pleasant surprise to meet Denver, watch him react to his first taxi ride and to see him absorb the atmosphere of the convention.

Hailing from the University of Idaho, Denver was quick to point out that he hoped someday to settle in a television job in a medium size city in the West. There always is the hope that students will follow a line of work closely related to their scholarships.

It was good to see Visual continuing its scholarship as they turned the final pages on a bad business year.

Notably, the exhibit halls were wider. The absence of GE, RCA and others was obvious. Exhibitors reported a brisk business on the floor, but for many it was wishful thinking.

There were a few bright spots in the exhibits. Magnavox joined the growing number of low cost color camera lines with a unit that most were comparing with the small RCA camera. A problem for manufacturers to overcome is that educators are quite familiar with the giant lines (like GE, RCA, Magnavox, etc.), because they produce home entertainment products. If they buy by name, the manufacturers have some educating to do. There were some new products on the line and a few new company names. They will be covered in this BE's New Products section in this and following issues.

Engineering sessions were well attended, but there seemed to be no end of the shifting audience in the back of the rooms. Apparently, larger rooms are needed for future sessions and the sessions themselves should be more circuit and technique conscious.

The responsibility for updating engineering practices must fall at least partly to the national associations that represent engineering. Will, in non-commercial broadcasting, the schools pay to continue the training of engineers and technicians? Will, on the commercial side, the licensee pay the same freight?

From an educational standpoint, there is much to be done and no one should be expected to accept the total responsibility. We could say that the manufacturers also should be involved. After all, the the engineer will be working with their new equipment. So it seems fair to say that in order just to keep pace with technology, more should be offered than is presently available.

There have been some sessions at other conventions that have been rewarding to the engineer. And that reward is passed along to the system. But there must be a conscious effort to inform.

So it's on to the National Association of Broadcasters, IEEE, NAFMB, and IBS conventions in March. Look for further convention reports in BE. ▲

ENGINEER'S EXCHANGE

Goodbye Glitches

Camera Relay Revision

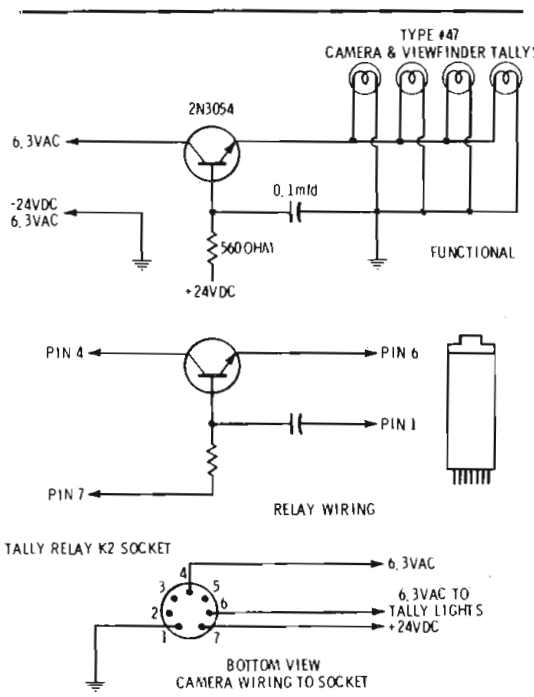
The advances in solid state technology are such that, it appears, if you fully understand a problem or requirement, there is already a mass produced, low priced, solid state solution on the shelf at a local parts store, awaiting its new duties.

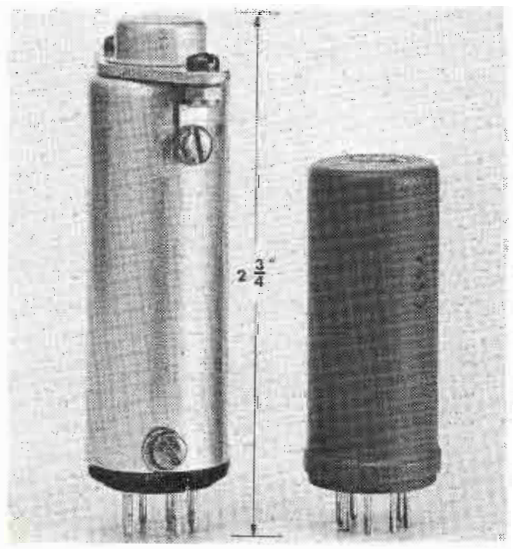
At KOMO-TV the problem was video glitches in the picture. These were traced to the fact that the camera tally lights received power from the same filament transformer as the image orthicon tubes. The expensive little relay switched rapidly and with contact bounce causing two horizontal flashes in the video. The solution proved twofold in its benefits. We worked in the direction of a slow, smooth switch and the bonus result was that we never bought another $25 relay. These relays had shown a tendency toward a rather high mortality rate. Now, after four years of continuous use, the solid state replacements have never been removed from the sockets.

The choice of transistor was influenced by the voltages available. The 2N3054 was inexpensive, husky enough to carry the lamp current, and of the correct polarity to plug right in.

The system of the RCA TK-41 camera uses a 24 volt supply to close a relay and supply 6.3 volts to the tally lamps. As the accompanying diagram shows, we chose to trigger a transistor at its base with the trigger voltage slowed by the R-C time constant series circuit to ground. Ground was –24 volts and also common of the 6.3 volt lamp supply. As the transistor is turned on, the 6.3 V tally supply is allowed to pass through the lamps. Turn off is accomplished by removal of the 24 volts. Removal is automatic when another camera is switched on.

Construction was made easy by the use of a Keystone Electronics Corp. aluminum housing with header, Part No. 4350. The components were solidly soldered, insulated carefully, then stuffed down in the housing. The transistor case is at a voltage above ground and being bolted to the metal cylinder by tiny angle brackets, it required a minor safety measure. We sprayed the entire device with several coats of Krylon to prevent accidental shorts.





The slower switch is barely perceptable to the eye, the glitches are gone and, the tally lamps are predictably unconcerned that their sine wave is not so pure.

This unit is fully compatible and will plug in to any TK-41 camera.

Fred Fowler,
Seattle, Washington

Church Remotes

Whether a station handles a church remote as a public service or a genuine source of revenue, station costs should be kept to a minimum. This usually results in some form of un-attended operation. For monthly rotated broadcasts this means moving the equipment every 30 days. If the broadcasts don't rotate, this still means equipment lying unproductive the rest of the week.

One answer is to connect the 70 volt or 500 ohm tap on the churches PA amplifier to the telco line for the feed. The amplifier may be left this way with no imparement of its normal operation. In every case this procedure has been successful for us where the following precautions were taken:

Be sure the amplifier is in good repair. Some churches leave the maintenance of this equipment to inexperienced people. Be sure the speakers are properly connected and that speaker switches do not drastically change the loading which would result in noise and level changes. If the speaker hook up is not correct be careful about volunteering to do the repair since some extensive systems can be time consuming when it comes to checking them out.

Make sure there is a mic at each point the church wants covered during the broadcast. Also check to see that levels are correct and that they don't get changed during the week.

Jim Purcell
Creve Coeur, Ill.

Send Your Exchange Ideas to Broadcast Engineering Yes—We Pay

Broadcast Engineering®

1970 Annual Index

NEW PRODUCTS

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

Ward Electronics

Test Equipment Spotlighted

TV Test Equipment

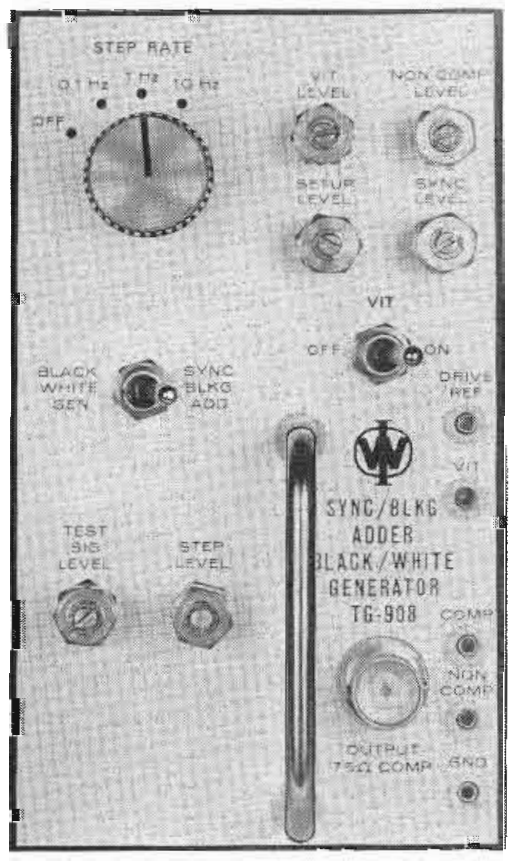
A new line of rack mounted test modules for use by TV stations has been developed by **Ward Electronics.**

The line comprises five units: a pulse bar and ramp signal generator; a linearity—variable APL generator; a multiburst generator, a combination sync/blanking adder and black/white generator; and a bar and dot generator.

Each test generator is self-powered, completely independent, and can be used with or without other generators. All units in the new series can be driven internally or by external sync.

In addition, the new test modules can be run off of composite video. This feature makes them ideal for transmitter sites, at which sync generators are often not available.

Another important feature of the new test generators is that each provides three composite outputs, plus a vertical interval output—all of which can be used simultaneously.



The new Ward series requires no auxiliary items such as vertical interval keyers or adders. The independent VIT keyed outputs provided can be used to insert test signals on a selected line in the vertical interval, permitting performance checks during program transmission.

Each of the five units occupies two units of a 5¼" rack frame with a capacity of 12 units.

The model TG-905 Pulse Bar Amp Generator is used to check phase distortion, transient response and linearity in television systems. It provides simultaneous vertical interval and full field testing. Included are Sin² pulses (T1, T/2 and 2T); a window signal and Sin² edge transitions; and a ramp generator for linarity measurements.

The model TG-906 Linearity—APL Generator is used to check linearity, differential phase and differential gain under the various conditions of Average Picture Level (APL) experienced in practice. It includes modulated and unmodulated stair steps which are switchable between five and ten steps; modulated and unmodulated ramp; variable Average Picture Level, which is switchable to 10%, 50%, and 90%; and internally or externally generated subcarriers.

The model TG-907 Multiburst Generator is used to check amplitude/frequency response at specific, critical frequencies in the overall system bandpass. It includes a "white flag" reference white level followed by six keyed burst frequencies (0.5 MHz, 1.5 MHz, 2.0 MHz, 3.6 MHz, and 4.2 MHz).

The model TG-908 Sync Blanking Adder and Black/White Generator has two functions. Its first is to

add sync and blanking to video sweep or sine wave test signals, permitting frequency response measurements of equipment which use clamping circuits. Its second function is to provide a low frequency step, cycled between 10% and 100% APL, to check the low frequency response of the system, especially the clampers. Sync and blanking are internally regenerated.

The model TG-909 Bar and Dot Generator is used for adjusting the horizontal and vertical linearity of camera and monitor sweep circuits, as well as adjusting color monitors for convergence. It provides a standard cross hatch pattern with dots only, bars only, horizontal bars only or vertical bars only. The horizontal line width is one scan line and vertical lines are 200 nsec wide. The rise and fall time of the horizontal transistion are approximately 100 nsec wide.

Independent VIT keyed outputs can be used to insert test signals on a selected line in the vertical interval, permitting performance checks during program transmission.

Thirty day delivery is normal for the new Ward test equipment line.

Circle Number 60 on Reader Reply Card

FM Exciter

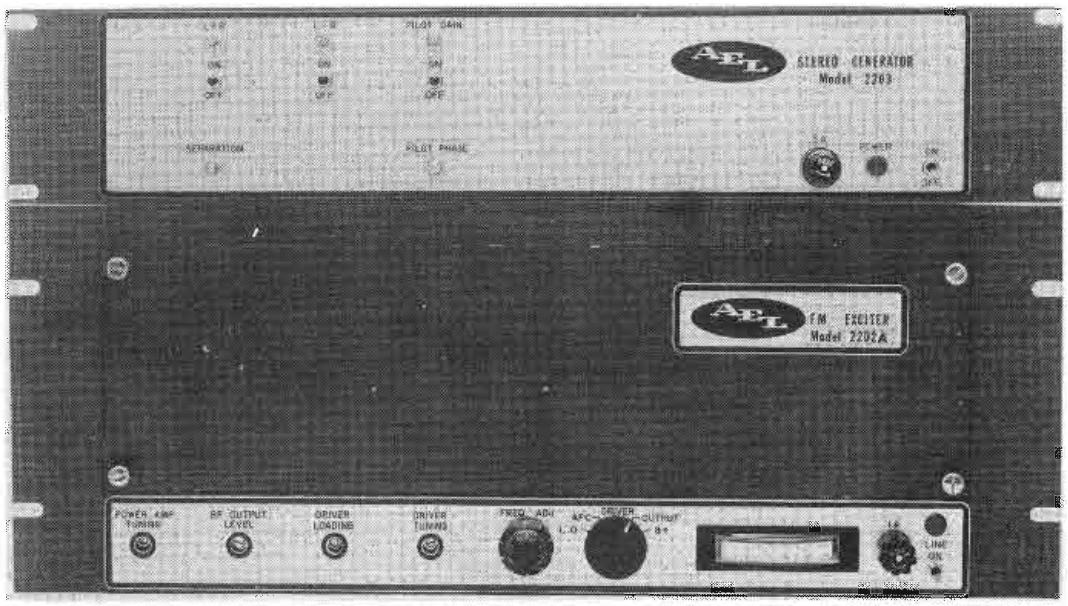
American Electronic Laboratories, Inc., announces the granting of FCC type acceptance for its newly improved Model 2202A solid state direct FM exciter. The Model 2202A features extremely low distortion with excellent response and noise specifications.

Generated at carrier frequency, the signal is held within ±1000 cycles by environmentally controlled AFC circuitry.

The exciter readily delivers 10 watts with a 50 ohm load and can be mismatched up to 2:1 VSWR. Should there be as much as ±15% line voltage fluctuation, the unit will still deliver its rated specifications.

When mated with AEL's Model 2203 solid state stereo generator it produces an unmatched combination. Price: Model 2202A—$2,250; Model 2203—$1,180.

Circle Number 61 on Reader Reply Card



ITFS Repeater Amplifier

The problem of microwave shadow reception in ITFS systems now has an answer—a **Jerrold Electronics Corporation** development—in the Model SBB-1 2500 MHz broadband, high-gain linear amplifier.

Aptly labeled the Beam-Bender™, the SBB-1 solid-state amplifier is combined with two high-gain EPA parabolic dish antennas, one for receiving ITFS broadcasts from the main station and the other for transmitting the amplified signals directly to the shadowed receiver. The beam-bender system, designed for all-weather, unattended operation, must be placed in line of sight with the main transmitter and the shadowed receiver. The transmitting and receiving dishes are cross-polarized to eliminate oscillation.

While the beam-bender is intended for use from three to ten miles from the originating transmitter—with signal retransmission up to one mile—large eight-foot dishes can extend the retransmis-

(Continued on page 54)

(Continued from page 53)

sion range to two miles. The SBB-1 has a gain rating of 40 dB, gain control of 6 dB, and noise figure checks out at 8 dB. Amplification is linear across the ITFS band (2500-2686 MHz).

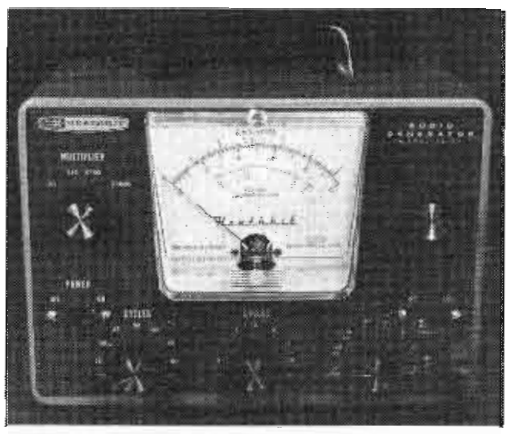
Jerrold engineers put the beam-bender system under a 90-day, around-the-clock test through the 1969-70 winter in suburban New York over ITFS channels E1, E2, and E3. At the end of the test in late February, engineers announced that the concept of a low-power, linear amplifier repeater for bending signals around obstacles to shadowed receivers is practical and workable in all respects. (Jerrold presently has a petition before the FCC for provisions to be added to the rules governing installation of ITFS equipment so that the SBB-1 may be type approved.)

Circle Number 62 on Reader Reply Card

Audio Generator

Heathkit has come up with a switch selected audio generator that produces a precision sine wave signal. We built this one in the BE lab and found that it is all Heath claims it to be.

The beauty of the unit is that you can set up an audio frequency and be certain that when you need to refer to that frequency again, you will dial it exactly. There is no guessing.



Called the IG-72, the unit has less than 0.1% distortion from 20 to 20,000 Hz. It also has a monitor panel meter calibrated in RMS volts and decibels. The output is selectable in six ranges .003 to 1 volt RMS into a load of 10,000 ohms, and —60 dB to +22 dB in 8 steps.

The generator can be built in six to eight hours. Kit price is under $50, under $70 wired.

Circle Number 63 on Reader Reply Card

Remote Equipment Shelters

Portable communications stations to house thermoelectric generators and radio transmission gear in remote regions have been improved to withstand extremely severe environmental conditions, **3M Company** has announced.

The shelters, which are constructed of leak-proof, seamless fiberglass and insulated with foam for close control of interior temperature, are supplied with one to six thermoelectric generators providing 50 to 300 watts of power. Waste heat from the generator thermopiles is used to thermostatically control the temperature within the shelter, which houses the radio gear and batteries.

Circle Number 64 on Reader Reply Card

Character Generator

A new model character generator, with numerous features available for the first time in such a unit, was introduced at the 1970 NAEB Convention by **TeleMation, Inc.**

The TCG-1425 provides both full-page and partial-page alphanumeric displays for any television application, producing up to 14 lines of 25 characters each. A fifteenth line is available for "preview" copy.

To facilitate composition and editing, the unit includes automatic line-by-line centering; hop-left and hop-right functions to shift a group of characters or a word one space to the left or right; deletion of any letter, word or line with a keyboard control; insertion of "preview" line copy into any other line on the page; and a "clear page" control to delete the entire display. A flashing control is included to empasize a letter, word or group of words.

Three modes of display are standard: in the static mode, information is stationary on the screen; in the crawl mode, one line moves horizontally across the screen; and in the roll mode, one or more lines roll vertically from the bottom to the top of the screen.

Th TCG-1425 features larger, easier-to-read characters than on earlier models. Characters may be keyed, wiped, matted or supered in the same manner at any other video source.

Circle Number 65 on Reader Reply Card

Color Bar Generator

Richmond Hill Laboratories has a new color bar generator available they are calling the TS-13 series. The unit features all silicon solid

state circuitry and modular plug-in construction. In fact, all modules have their own separate, self-contained power supplies.

The TS-13 color bar generators' R,G,B,I,Q, and Y and composite encoded color bar test signals conform to EIA specifications RS-189.

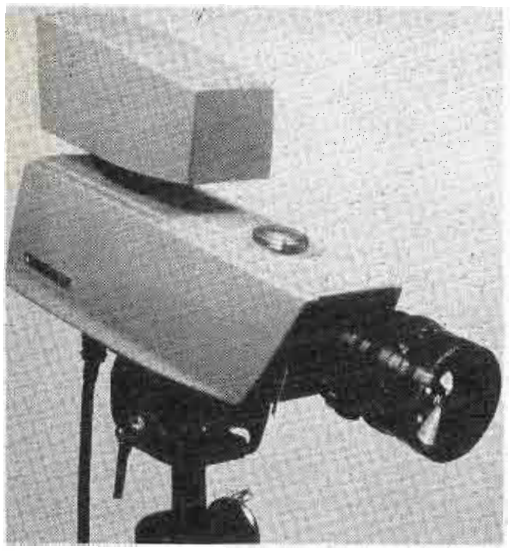
Only composite synchronizing, blanking and 3.579545 megahertz subcarrier signals are required to produce all output signals. And this low power consumption unit will fit into a standard rack mounting frame with minimum space requirements.

Other specs look like this: sync input is 2 to 8 volts p-p; blanking input between 2 to 8 volts p-p; input impedance at 80 k ohms: output impedance is 75 ohms; isolation between 60 dB; amplitude stability 1%; chrominance phase is within 2 degrees; and R,G,B relative timing is within 100 nanoseconds.

Circle Number 66 on Reader Reply Card

Color TV Camera

Magnavox introduced its new single vidicon color television studio camera on the opening day of the National Association of Educational Broadcasters Convention in Washington, D.C.



Weighing in at only 30 pounds. The manufacturer claims the single vidicon design eliminates the color registration problems of other video cameras, and the consequent electronic simplication results in high reliability and easy maintenance. A tiltable viewfinder and a ten-to-one zoom capability are standard equipment.

The camera, designated Series 100, operates in an illumination range from 75 to 250 foot candles. This is a light level about one-fourth that usually required in a studio.

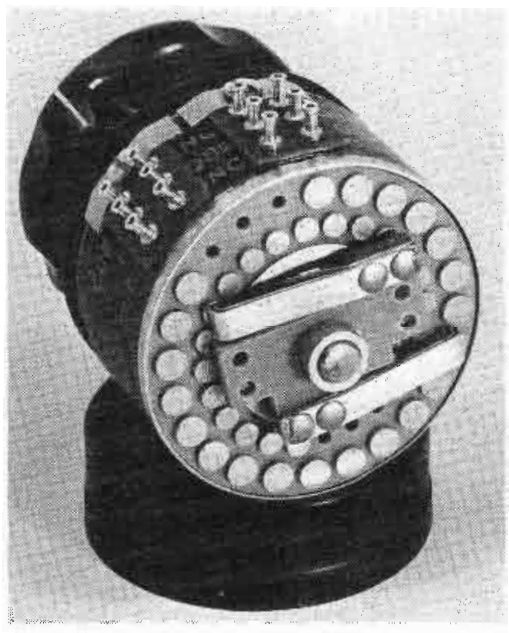
Magnavox also showed a new three-port multiplexer. The equipment will accommodate two film projectors and one slide projector and can be controlled for any desired sequence from the multiplexer itself or from a control console.

At NAEB, two Magnavox cameras and the multiplexer were shown as part of a complete studio setup which also includes audio equipment, videotape recording and playback equipment, monitors, a uniplexer and a control console.

Circle Number 67 on Reader Reply Card

Stereo Attenuator

A new compact stereo attenuator is now available from **Shallco, Inc.** This design provides two unbalanced ladder circuits on a common shaft. Isolation between channels exceeds 80 dB. Premium materials



assure low noise and a long trouble free life. Split dust cover permits convenient access to switching mechanism. Available in 20 steps with or without cueing and standard impedances. Diameter: 2⅛″, Depth: 1⅞″ (no cue); 2⅛″ (with cue).

Circle Number 68 on Reader Reply Card

Signal Tracer

The **EICO** model 150 solid state Signal Tracer just off the line in wired or kit version offers a convenient unit for servicing a wide variety of equipment.

A high gain RF and medium gain audio input selection is possible. And separate probes are provided. Each probe is attached to its own panel receptacle, permitting easy changeover from channel to channel.

(Continued on page 56)

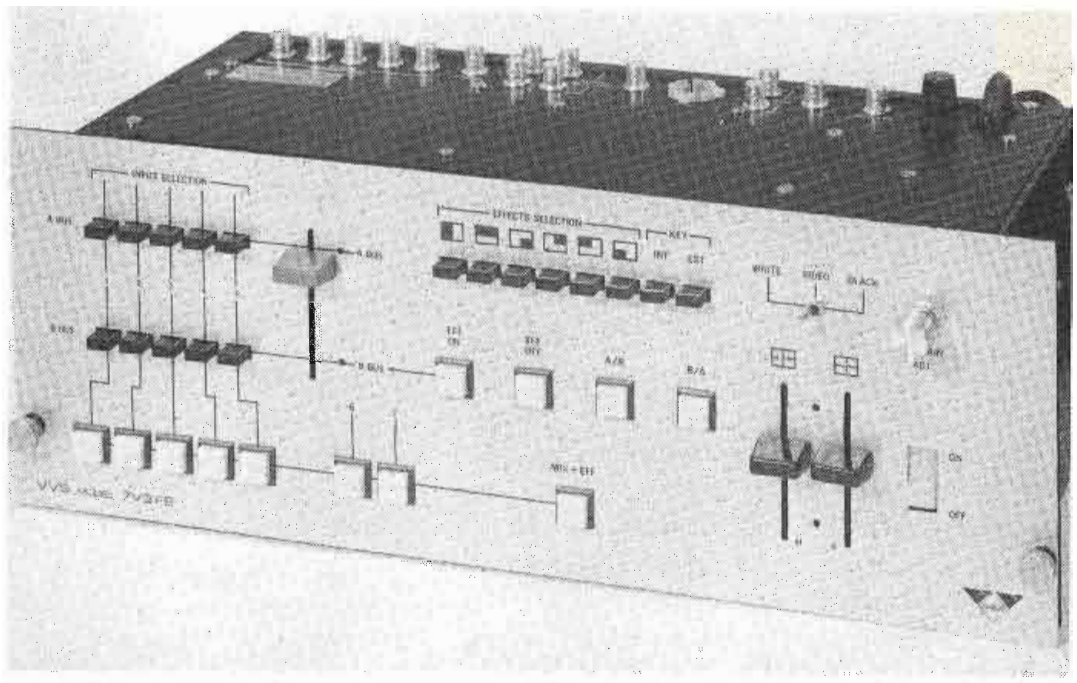
(Continued from page 55)

The unit also includes visual and aural outputs for monitoring signal strength and gain per stage. A built-in speaker is used along with a 200 microamp meter.

The 150 also has an independent self-contained output transformer, and it may be selected for use with either single-ended or push-pull amplifier circuits. What's more, the speaker can be tapped from the front panel as a substitute speaker for a unit under test. And in a pinch, the unit can be used for an audio amplifier. We built this unit on the bench at BE and found it to meet or exceed the manufacturers specs.

Circle Number 69 on Reader Reply Card

Video Programmer



Viscount Video Systems has a new line of video switching programmers that should be of interest to educational and CATV systems. An economy package, the 7V3FE shown here offers five synchronous and two non-synchronous inputs, vertical interval switching on cut bus, "isoswitch" integrated crosspoints, and six wipe patterns.

Also featured is the internal-external keying option, built-in black/white matting generator, preview of mix plus effects, fades to black and to effects, and an automatic camera phase correction circuit.

Frequency response is ±0.5 dB to 10 MHz with the tilt less than 2% (line or field). Crosstalk is better than 50 dB down at 3.58 MHz.

Special effects include: four corner wipe patterns plus vertical and horizontal split screens, and all wipes are fully adjustable and the patterns are reversable. The dimensions are 19"x7"x6½".

Circle Number 71 on Reader Reply Card

Vertical Aperature Equalizer

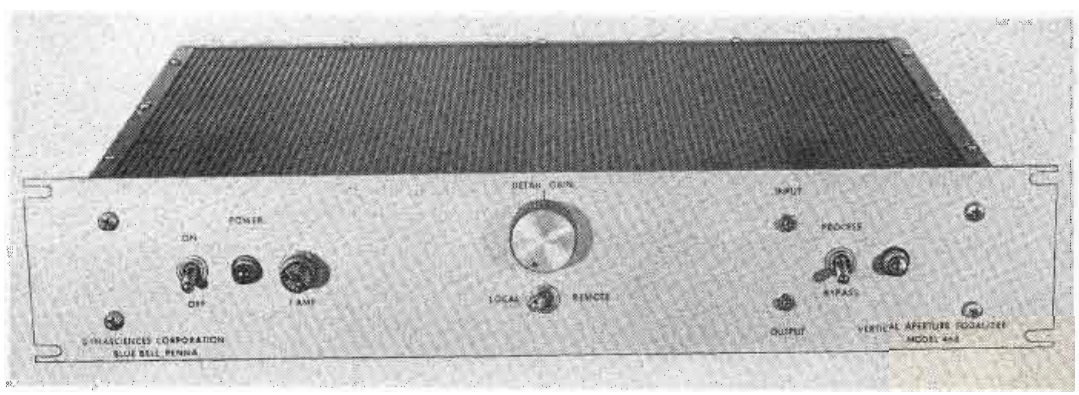
The vertical aperature equalizer is available from **Dynasciences Corporation,** and all it does is enhance the clarity and sharpness of picture transmission by eliminating "fuzziness," out-of-focus, and bleeding colors. These features are especially important when the eqalizer is used with inexpensive TV cameras.

Two basic units are offered: single-line and two-line. The two-line unit features single line comparison: the line directly above and below one horizontal line. This gives a difference compensation by inserting an aperature equalization signal into the main signal path.

In the single-line equalizer, the horizontal line is compared only to the line preceding it. Because its use is limited to certain subject matter, this unit can be converted to two-line.

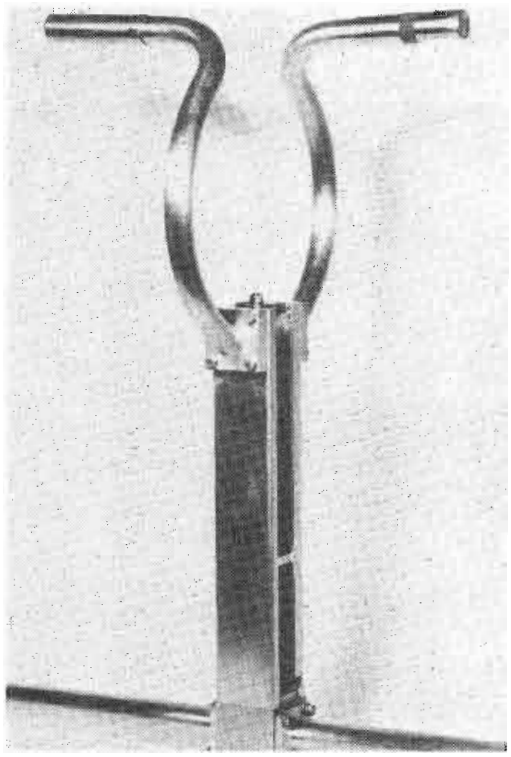
Input and output impedance is 75 ohms, and the input and output amplitude is 1 volt peak to peak. No input is required other than the signal to be processed. The units are controlled either at their front panel or by connecting a 3-wire cable to a remote location.

Circle Number 70 on Reader Reply Card



LPC FM Antenna

The **Collins** LPC circularly polarized antenna is a low power, low cost version of the well-known Collins 37CP antenna. The LPC is designed for monaural, stereo, and multiplex FM transmitters with power outputs of 5 kW or less.



The manufacturer claims that this antenna has a low-standing-wave ratio over the 200 kHz FM channel, providing optimum conditions for stereo multiplex operation.

Wind loading of the LPC antenna is approximately half that of the Collins 37CP, which means tower loading factors will be much lower. The design is flexible and permits ease of installation on the side of an existing tower, or pole mounting on top of towers or buildings.

Circle Number 72 on Reader Reply Card

Microwave Amplifier

Microwave Associates, Inc. announces the release of a total solid-state RF amplifier for Broadcast TV relay users in the 1990-2110 MHz auxiliary broadcast band. Model PA-210 faithfully reproduces a 2 watt input signal and delivers 10 watts of RF output power.

The PA-210 may be used with any existing 2000 MHz, 2 watt transmitter to substantially improve TV relay fade margins in intercity systems, studio transmitter links or in portable applications.

The PA-210 increases existing 2 watt transmitter power, such as the MA-2A and MA-2B series, by 7

(Continued on page 58)

(Continued from page 57)

dB for "brute force" signal improvement.

Use of this 10 watt amplifier in new systems allows a wider selection of antenna size, greater hop length or longer RF cable runs. The design is fail/safe and is entirely solid-state, thus providing operating savings by eliminating tube or klystron spare parts inventory.

The PA-210 is available with AC or DC power supply included and in panel rack mount or portable versions.

Circle Number 73 on Reader Reply Card

Automatic Logging

The industry's first, ENGLISH TEX, automated station logging has been introduced by **Cybrix Corporation.** Named TVS (traffic Verification Systems), the "real-time" printed logs offer direct reporting off the actual broadcast tape without the use of punched cards or paper tape.

The compact hardware features standard typing inputs with no format limitations, on-line editing without computer participation and channel buffering with no loss of information on fast turn around time events.

According to the manufacturers, these practically maintenance-free TVS units are compatible with both automated and non-automated stations. They also function independently from the tape program preparation equipment and can be separated from it by any distance.

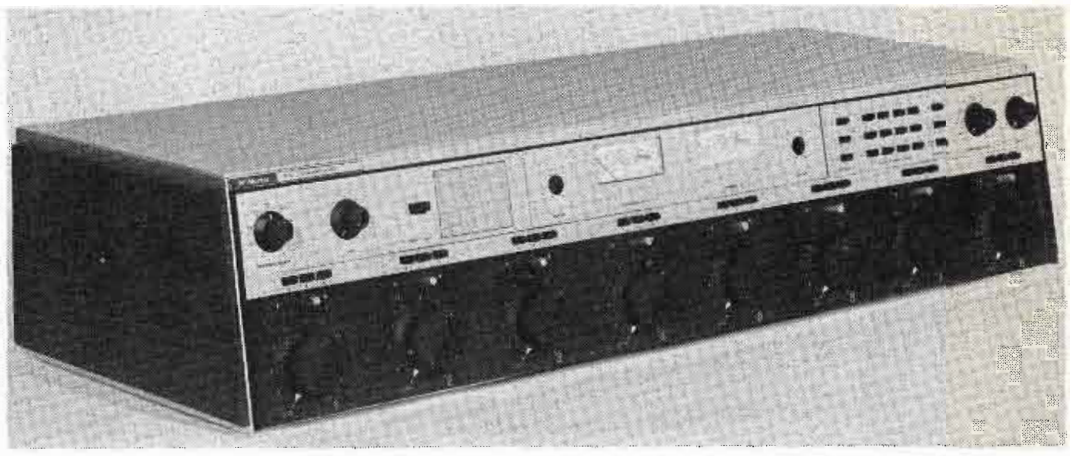
Optional feature allows storage of data for automated billing. The fully integrated circuitry ensures the highest degree of reliability. In addition, an 18 months factory warranty is given with each purchase.

Circle Number 74 on Reader Reply Card

New Audio Console Line

McMartin Industries, Inc., announces a new line of audio control consoles designed for AM/FM/TV broadcast and recording studio applications.

The B-801 monaural; B-802 stereo and B-803 dual channel models each feature eight input mixing channels with preselection of three sources for each mixer. Plug-in modules are utilized throughout.



microphone or high-level service or any intermixture desired.

Spare contacts on input preselect and lever-type bus selection key switches are provided to allow extension of studio speaker muting/warning light relay logic.

Step-type, maintainable, channel attenuators are equipped with cue positions on all eight mixers.

The consoles are completely self-contained and include complete, selective intercom facilities for three studios, four remote lines and a general paging location. Headphone monitoring of eleven points within the console system is provided.

The standard complement of modules accommodate three microphone, four unbalanced high-level and one balanced high-level mixing channels. A total of twenty-seven input sources may be controlled.

The modular, plug-in feature permits extra flexibility in the console system since module connector wiring has been designed to permit interchanging of input modules. To meet specialized requirements, all eight mixers can be assigned to

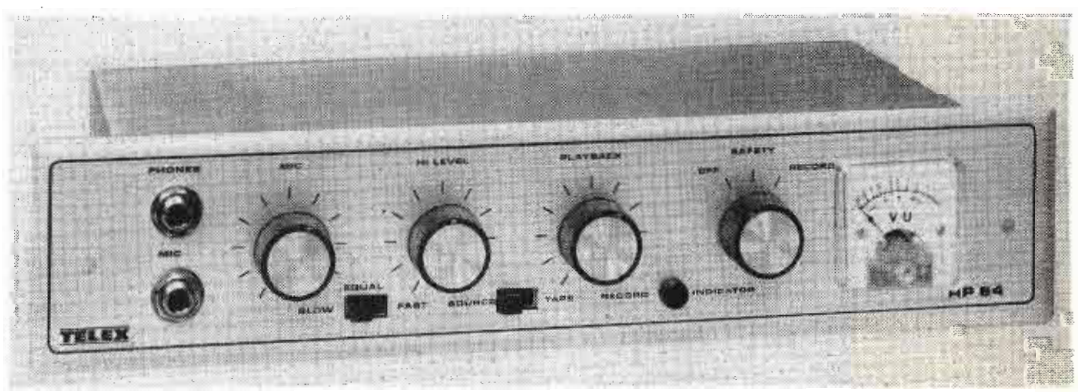
The new consoles exhibit excellent performance characteristics over the 20 to 20,000 Hertz spectrum with ±0.5dB frequency response; total harmonic distortion at 0.5% or less and 74dB S/N ratio for the program channel(s). Eight-watt (RMS) monitor amplifier capability with ±0.5dB response and THD of 0.75% less at full output is featured.

Circle Number 75 on Reader Reply Card

Record Preamp

Telex has introduced the model RP-84, a versatile, compact, professional record and playback preamplifier. It is specifically designed for magnetic tape recording and playback with standard NAB calibration.

The solid state RP-84 can be used with either two or three head tape transports and includes an A-B tape monitor switch. An equalization selector switch and a slow/fast speed switch match the unit to any tape transport operating from 1⅞ to 15 IPS. Bias adjustment of the RP-84 provides optimum record level and an overall frequency response from 30-18,000 Hz±3 dB at 7½ IPS, with total harmonic distortion below 7% at kHz. The bias oscillators of two or more



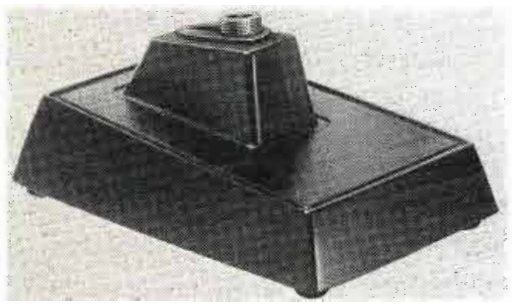
RP-84's can be synchronized for multi-channel applications.

Model RP-84 can be used with quarter, half and full track head configurations and provide mixing of microphone and line inputs. It has a high impedance phone jack, VU meter, record light and record interlock. The unit is priced under $145.00. Telex also offers both open reel and endless loop cartridge transports.

Circle Number 76 on Reader Reply Card

Microphone Stand

A new microphone desk stand designed to accept microphones with both swivel adapters and swivel connector assemblies has been announced by **Shure Brothers Inc.,** Evanston, Illinois.



The new desk stand, the Model S37A, is a stable, low-profile die-cast base that is finished in a neutral gray and textured to reduce glare. The mount is designed to accept any base with a 5/8"-27 stand thread.

List price for the Model S37A is $9.00.

Circle Number 77 on Reader Reply Card

Extender Amplifier

Sylvania Electric Products Inc. is now offering a full line of broadband equipment for cable television operations. Sylvania is a subsidiary of General Telephone & Electronics Corporation.

James L. Dangremond, Product Marketing Manager for cable equipment, said principal products in the basic line include a fully modular trunk amplifier station available with optional features which provide additional functions; a line extender amplifier with ALC; a directional coupler multi-tap; a power coupler; a splitter, and other complementary devices.

The line extender amplifier is offered in two models; manual gain, and total automatic level and slope control. A dual pilot control feature of the total automatic control

model permits higher operating levels in distribution and tighter control of these levels. High overload-to-noise capacity and superior VSWR characteristics permit both models to be used as economical trunk amplifiers.

Contained in cast aluminum, weatherproof housings, the line extender amplifiers have wide bandwidths of 50 to 270 megahertz.

Circle Number 78 on Reader Reply Card

6 & 11 GHz Two Port Microwave Antennas

Andrew Corporation is offering dual frequency 8, 10 and 12 foot diameter parabolic antennas for the 6 and 11 GHz common carrier bands. The two signals are orthogonally polarized with 30 dB minimum isolation.

Designed for use in cross band diversity systems, these antennas are also ideal for use wherever 6 and 11 GHz bands are used for the same path. For example, a single antenna can be used for CATV microwave relay in the 11 GHz band and standard voice or data channels in the 6 GHz band.

Shielded high performance versions with better than 65 dB front-to-back ratio over 180° ± 80° are available on special order.

Premium HELIAX Elliptical Waveguide Types EWP56 and EWP107 with tuned connectors are recommended for use with these antennas.

Circle Number 79 on Reader Reply Card

For more details about products in this issue use free readers service card in the back of this issue.

TECHNICAL DATA

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

100. AMERICAN ELECTRONIC LABORATORIES, INC.—New literature describing AEL's APX series of Crossed Planar Log Periodic Antennas for frequencies from 100 MHz to 12.4 GFz is now available. The AEL Crossed Planar Log Periodic Antennas are capable of receiving linearly polarized waves in either plane and by the use of additional components other polarizations including oblique and circular (either hand) can be received. Designed for ECM, surveillance and other applications where polarization and broadband frequency diversity are desirable these antennas are also useful as feeds for parabolic dishes. Special features of these antennas are wide bandwidth, simultaneous horizontal and vertical polarization, high isolation between polarizations and lightweight, rugged construction.

101. ALDEN ELECTRONIC & IMPULSE RECORDING EQUIPMENT CO., INC.—A 44-page illustrated general catalog describing Alden's entire line of facsimile equipment and accessories is now available. The catalog contains complete product descriptions, specifications, and pricing for Alden graphic communications equipment, satellite tracking systems, oceanographic instrumentation and weather chart recordings. Also included are illustrated equipment applications in such fields as signature verification, information storage and retrieval, infrared scanning for early detection of cancer, oceanographic research and infrared and ultrasonic flaw detection.

102. B & K INSTRUMENTS, INC.—A new 12-page brochure describing B & K's full line of precision measuring microphones and supporting accessories is now available. The brochure contains photographs, graphs and illustartions of the products. Some of the features are: wide frequency ranges, wide dynamic ranges, flush mounted diaphrams, artifically aged for long term stability, rugged construction, all operating characteristics well defined, all important data individually calibrated and supplied and wide range of accessories.

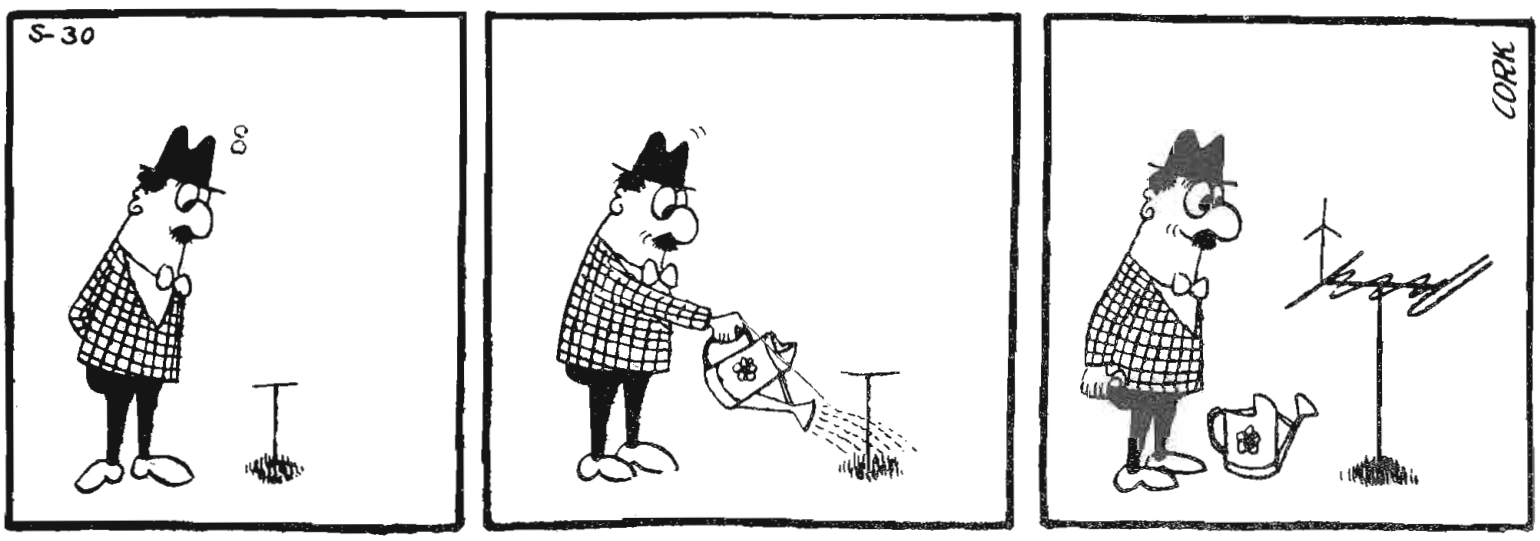
103. BOURNS INC.—A new 20-page potentiometer brochure is now available from the Trimpt Products Division of Bourns. The brochure includes product photographs, specifications, order information and pricing for more than 100 adjustment, precision and panel control potentiometers. All models carried in stock by distributors are indicated, and a reference index at the beginning of the brochure groups models according to performance. Added features include an explanation of the Bourns numbering system and a guide to the selection of precision potentiometers.

104. CHERRY ELECTRICAL PRODUCTS CORP.—A new Keyboard Information File describing their electronic data entry keyboards is now available. The data is contained in a new four-color information-packed folder. Included are two separate bulletins giving detailed specifications on the unique Cherry individual Key Module and complete Cherry Keyboard arrays. A third bulletin, the Keyboard Designers' Specification Sheet, includes easy-to-use, step-by-step worksheets for custom designing keyboards.

105. COHU ELECTRONICS, INC.—Three distribution amplifiers for use in broadcast or closed-circuit television applications are described in a new six-page, two-color technical data sheet. The sheet (6-535) includes 15 photographs and three types of specifications.

106. ELCO—A new brochure from Elco describes their total packaging concept of manufacturing and servicing back panel interconnecting systems. The brochure describes and illustrates the company's capacity for handling all phases of back panel building, from the design stages through the manufacturing processes. The brochure illustrates the many standard connector components available. Also, the basic types of back panel assemblies are discussed; the laminated printed circuit board, the perforated metal plate, and the metal connector frame configuration. The brochure carries the total packaging concept through its final stages in describing the various methods for wiring the back panels.

107. THE HALLICRAFTERS CO.—A four-page, two-color brochure featuring the new, low profile 30-watt, all solid state designed



"Porta-Command" Model PC-230 FM 2-way radio which operates in the 132-174 MHz range, weighs only five pounds, takes up less than 250 cubic inches of space, provides up to 12 channels of performance across, one MHz with no power loss and is instantly adaptable with accessories to mobile, base and manpack operations is now available. The colorful illustrated brochure provides the complete mechanical and general specifications of the 30-watt FM 2-way radio including the full line of accessories which expand the new radio's versatility. The easy-to-read PC-230 literature is designed for the communications user requiring exacting FM area coverage in law enforcement, fire protection, security, construction projects, railroads, airports, oil fields, educational institutions, harbor protection and other business services.

108. KAY ELEMETRICS CORP.—A new eight-page Short Form catalog describes a complete line of sweep and marker generators, CATV test instruments, noise generators, automatic noise figure meters, pulse generators, wideband amplifiers, log amplifiers, sweep synthesizers, telemetry FM signal generators, precision attenuators, programmable attenuators, and audio spectrum analyzers. In addition, the brochure features Kay's new state-of-the-art Counter/Marker system which lets you accurately count frequency while sweeping.

109. LTV LING ALTEC, INC.—Altec Lansing Division. The newest techniques and equipment for sound systems in the sports and entertainment fields is covered in a 12-page brochure now available. The colorful publication illustrates the equipment used in sports arenas, stadiums, automobile speedways, hotels, restaurants and other public entertainment buildings throughout the United States. Also detailed is Altec's exclusive Acousta-Voicing® process which is used in many of these buildings to improve the clarity of the sound and to provide a uniform sound level while eliminating feedback and reverbration problems. The extensive eqipment line is pictured along with many unique products in sound system installations offered only by Altec.

110. MITEQ, INC.—A new 16-page catalog of microwave systems components and systems design data is now available. Included are RF converters; mixer-preamplifiers; solid state low noise amplifiers; tunnel diode amplifiers; cavity, voltage-tuned and capacitor-tuned oscillators; and specially designed RF and IF subsystems. A special section offers quick reference data for systems engineers.

111. OHMITE MANUFACTURING CO.—An innovative Quick Delivery Identification system—featuring a 3-level popularity grading guide to automatically forecast availability and required lead time for major component items—is highlighted in a new 36-page shortform catalog. The new identification system utilizes bold face type, light face type and parentheses to indicate product availability based on nationally exhibited usage patterns. The components described in catalog 300B include resistors, rheostats/potentiometers, trimmers, potentiometers, tap switches, variable transformers, relays, solid state power controls, RF chokes and various design aids.

112. PAMOTOR — A six-page, two-color technical bulletin on the company's new line of premium grade grade fans, the PENTAFLOW Series, carrying a five-year warranty is now available. These all-metal, shaded-pole type axial fans are intended primarily for limited-production, deluxe original equipment, laboratory instrumentation, and custom-designed systems, requiring the highest efficiency and reliability, and for field replacement of conventional fans that have proved unreliable or inadequate. They are also suitable for a broad range of communications, data-processing, office, studio, industrial control, and other electronic equipment and systems.

113. PYCO, INC.—A new six-page brochure on Pyco thermocouple assemblies is now available. Pyco has standardized the size of protection tubes and the nominal gages of wire for ISA types T and E, 14 gage; for ISA types J and K, 8 gage; and ISA types R, S, and B, 24 gage. Listings in the brochure are designed to simplify selection of thermocouple assemblies. Included are standard, angle type, and pipe extended type asesmblies. Standard thermocouples are available in 18 single tube asemblies and 6 double tube assemblies.

(Continued on page 62)

114. RCA ELECTRONIC COMPONENTS — This booklet describes the RCA thyristor product line which is composed of more than 180 diferent types of SCR's, diacs, and triacs. This completely revised catalog in a completely new format contains detailed matrices showing principal characteristics of all of the devices. There is also a compilation of thyristor type numbers and ratings arranged by family classification and a group of charts presenting applications information for triacs and SCR's in certain specialized categories. Introductory material includes a brief explanatory note on triac firing modes as aplied to RCA devices.

115. SCIENTIFIC-ATLANTA, INC.—This applications note describes the Series 1700 Swept Frequency System. Fixed-frequency or octaveband swept frequency measurements may be made over an 80 dB dynamic range, from 100 MHz to 40 GHz. A few of the swept-frequency measurements that are described in the application note include: insertion loss, bandpass filter and directional couple characteristics, swept SWR, attenuator and reflectiometer characteristics.

116. SPECIALTY METALS DIV. OF MAGNETICS — Blendalloy strip for electronic applications—pure cobalt, 5 percent iron-cobalt, 4 percent tungsten-nickel and nickel-copper—is the subject of a new data sheet. According to the division, the alloys available in the Blendalloy strip offer exceptional purity, uniformity from lot to lot, homogeneity, absence of "tramp" elements, low gas content and the availability of small quantities for initial evaluations. These characteristics are dependent upon product purity and chemistry control, which are discussed at length. Included are tables giving the typical chemical composition of the available Blendalloy alloys and a description of other Blendalloy rod, wire and strip products for such critical applications such as glass-sealing, welding, plating, vapor-deposition and shielding.

117. TECHNICAL WIRE PRODUCTS INC. — A completely new eight-page color brochure is now available. Divided into four sections, it offers a wide range of shielding and conductive products and materials from conductive silver/silicone to shielding and ventilating panels. Technical information including shielding capabilities and application photos assist the design engineer in selecting or specifying the right conductive materials or products to solve his specific design problem. Each catalog contains two free Reader Service Reply Cards which can be used to request specific and part number information.

118. TELEDYNE PHILBRICK NEXUS—A new 48-page condensed product guide is now available. This all-inclusive publication provides designers with a convenient reference manual for selection guidelines, application tips, and operating techniques for analog instrumentation. Included are complete product performance and price listings for Teledyne Philbrick Nexus' diversified lines of analog computing components, operational amplifiers, nonlinear functional modules, test instrumentation, and related equipment.

119. TEXSCAN CORPORATION — A new 16-page product catalog outlining compelte specifications of all its CATV test equipment is now available. Also included in a section on related components. Included among this new CATV line is Texscan's model 9500 summation sweep system. This system is comprised of two compact instruments; the model 9500T which is the sweep unit for the head end and the model 9500R which is the portable receiver unit. This system provides a simple technique for doing complete system alignment without program interference. There is no audio distortion produced by this system and only one or two lines of video information are disturbed; thus allowing subscribers to continue to watch a program while system alignment is being performed.

120. TRIPLETT CORP. — A two-page technical bulletin that describes a new portable, battery-operated Laboratory and General Service FET Volt-Ohm-Milliammeter, the Model 801, with such exclusive features as: Low Power Ohms circuit for IC, transistor and other solid state devices; conventional ohms circuit for checking forward and reverse resistance of semiconductors; high sensitivity starting at .005 AC volts as 10 megohm input resistance; simplified scale with

8″ meter and only two arcs for 46 AC/DC ranges and other features, is now available. The two-color Bulletin #51670 is three hole drilled for reference binders. The new literature also provides the reader with complete DC and AC, DB, resistance and current measurement ranges that the new V-O-M covers plus complete mechanical and electrical specifications. Optional accessories available, and prices are listed.

121. VANGUARD ELECTRONICS—New miniature Broadband Transformers featuring transmission line techniques are described in a new 4-page brochure now available. Offering unusual flexibility in both application and packaging, Vanguard Series LUB and LBB broadband balanced and unbalanced transformers feature frequency ranges to beyond 500 MHz, low power loss and minimum phase and amplitude phase and amplitude unbalance. The units measure only 0.50″ sq. by 0.125″, and are available with or without DC isolation. Vanguard's ultra-miniature Series UBB and BBB measure only 0.125″ sq. by 0.080″ and perform comparably with units more than ten times their size, in frequency ranges up to 400 MHz. In addition to actual-size photographs, outline drawings and detailed specifications, the new Vanguard Broadband Transformers brochure lists some of the many and varied applications for the miniature broadband transformers. One page is devoted to Technical Notes and a typical frequency response curve for the entire series.

122. WESTINGHOUSE ELECTRIC CORP.—A new illustrated brochure provides operating characteristics, advantages, applications, and package dimensions for the Type 1723 series of silicon power transistors. The Type 1723 is a series of low-cost, double-epitaxial NPN transistors designed to meet the needs of manufacturers producing industrial control and commercial electronic apparatus. Fast switching speeds, low saturation voltages, high linear gain, and reliable operation make the new transistor series ideally suited for regulation, amplifier, and switching circuits. The 4-page bulletin presents the AC, DC, and thermal characteristics of the Type 1723 transistor series in both tabular form and on reproductions of curve traces. An engineering drawing gives the outline dimensions for the modified TO-3 transistor package.

123. XCELITE INC. — The new Bulletin N670 from Xcelite Incorporated introduces two new reversible ratcheting handles for use with more than 60 of the Company's individually available Series "99" nutdriver, screwdriver, and special purpose blades. The ratchet mechanism incorporated in the regular (Model 99-1R) and Tee type (Model 99-4R) plastic (UL) handles is described as being built to highest socket wrench quality standards and fully enclosed to keep out dirt and grit. A photograph shows how the ratchet reversing shift, easily operated by a flick of the thumb, is recessed in the handles to prevent accidental tripping while driving.

Hewlett-Packard Offers DC Power Supply Handbook

What is meant by auto-tracking? How can ground loops in multiple loads be avoided? What is the difference between a constant voltage/constant current power supply and a constant voltage/current limit supply? These questions and many others asked by power supply users are answered in a new edition of the Hewlett-Packard DC Power Supply Handbook. This Application Note, 90A, is written for the user rather than the theorist. It discusses both traditional and unusual application and problems of regulated power supplies.

The 138-page book is divided into six main sections: Definitions, Principles of Operation, AC and Load Connections, Remote Programming, Output Voltage and Current Ratings, and Performance Measurements. By providing an understanding of operation, performance and connection of regulated power supplies, this handbook helps the user recognize the versatility and performance capabilities of modern regulated power supplies. This book is available at no charge. Simply circle number 175 on the Reader Service card in the back of this issue and drop in the mail.

ADVERTISERS' INDEX

PROFESSIONAL SERVICES

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

AMPEX SERVICE COMPANY
A Department Of Ampex Corporation
500 Rodier Drive, Glendale, California 91201
(213) 245-9373
Service center for repair, modification, rebuilding of all Ampex helical-scan video recorders and associated equipment. Also the complete Ampex audio line.

WALTER F. KEAN
CONSULTING RADIO ENGINEERS
19 E. Quincy Street
Riverside, Illinois 60546
(A Chicago Suburb)
Phone 312-447-2401
Member AFCCE

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

ALLSTATE COMMUNICATIONS
ENGINEERS - CONTRACTORS
CATV - CCTV - VTR
1200 WEST CHESTNUT STREET
UNION, NEW JERSEY 07083
(212) 349-5240

Training

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

First phone through tape recorded lessons at home plus one week personal instruction in Washington, DC, Atlanta, Boston, Detroit, New Orleans, Minneapolis, Seattle, Denver, Portland, Los Angeles. Proven results. Our 17th year teaching FCC license courses. Bob Johnson Radio License Preparation, 1060D Duncan, Manhattan Beach, Calif. 80266. Phone 213-379-4461. 1-69-tf

IMMEDIATE OPENINGS: Qualify for any of the following positions: RCA CCTV Equipment, monochrome or color. Salesmen — TV Systems Engineers — Project Engineers — Supervisors — Managers — Maintenance Technicians — Video Engineers — to work either New York, Pennsylvania, New Jersey or California area. Write: RCA Rep., P. O Box 268, New Hyde Park, New York 11040. 4-70-tf

Equipment for Sale

CARTRIDGE TAPE EQUIPMENT—Completely reconditioned Spotmaster and Tapecaster Record/Playbacks. $375.00. Playbacks $250.00. 30-day money-back guarantee on all equipment. BROADCAST PRODUCTS CO., INC. 12330 Wilkins Avenue, Rockville, Maryland 20852. Ph: 301-933-3400. 10-69-tf

Surplus audio and video patch panels and patch cords. 500 to 500 ohm repeat coils flat to 20,000 cycles. Send for list. Gulf Electro-Sales, Inc., 6325 Beverly Hill, Houston, Texas 77027. 9-70-tf

HELIAX—STYROFLEX. Large stocks — bargain price — tested and certified. Write/call for price and stock list. Sierra-Western Electric. Box 23872, Oakland, Calif. 94623. Tele: (415) 832-3527. 1-71-tf

Finest RF coils, contactors, switches, custom ATU systems built for customers or dealers. Write or phone for catalogue. Geleco Electronics Ltd., 2 Thorncliffe Park Drive, Toronto 17, Ontario. Phone 416-421-5631. 8-70-tf

Bargain—General Electric Pyranol capacitors, 25 mfd. 6250 volts. 18 inches by 17 inches by 5 inches. Weigh 65 lbs. $20 F.O.B. William Ackard, 729 E. 17th Ave., Denver, Colo. 80203. 1-71-3t

Transmitter: Gates Model BC5-A 5kw/1kw. Available around December 15. In use at present time. $2750.00. Mastertone Company, 8101 University Blvd., Des Moines, Iowa 50311. 1-71-1t

Used Equipment: McMartin - Ampex - Magnecorder - CBS - other misc. Let us know your needs. New equipment available: Ampex - CBS - Belar - Tapex cartridges. Write for new and used equipment list. Mastertone Company, 8101 University Blvd., Des Moines, Iowa 50311. 1-71-1t

RCA AVQ-10 Weather Radar system complete with Raydome, Heater, 400 cycle power supply VJ-B monitors, cabling and spare parts. Excellent Condition. Box No. 246, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 12-70-2t

Hills 16mm. B/W negative processor in excellent condition. Easily converted to 16mm reversal, if desired. Sacrifice price due to move to color News. Box No. 247, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 12-70-2t

Equipment Wanted

We need used self supporting TV Tower around 200 feet, capable of supporting a low channel 3 bay batwing antenna at 40 pounds wind LOA—ding. Contact Mr. Pedro Perret De La Paz, P.O. Box 393, Eagle Pass, Texas. 12-70-2t

Wanted: 1 kw. A.M. broadcast transmitter. P.O. Box 1917, Redding, Calif. 96001, 916-243-0343. 12-70-2t

School desires Auricon on a donation basis. A tax receipt will be given. Art Department, Oregon State University, Corvallis, Oregon 97331. 1-71-1t

G.E. Transmitter Type TT-42-A, modified —(Ch. 2) used by WBBM-TV as its main transmitter until October 1, 1969. Equipment still installed at 33 North La Salle, Chicago. To be sold as is; buyer to remove. $25,000. L. A. Pierce, 630 N. McClurg Court, Chicago, Illinois 60611. (312) WH 4-6000. 1-71-tf

RCA Transmitter Type TT-5, water-cooled —(Ch. 2) used as a spare at the above location until October 1, 1969. Equipment still installed; to be sold as is. Buyer to remove, $5.000. L. A. Pierce, 630 N. McClurg Court, Chicago, Illinois 60611. (312) WH 4-6000. 1-71-tf

Help Wanted

Job Headquarters for all Radio and Television Engineers. Immediate openings exist in 9 western states and elsewhere for qualified engineer and technical personnel. All categories from trainees to experienced transmitter maintenance, chief, assistant chief, live color video maintenance and technical operations. Send us your complete resume now. The AMPS Agency, 3924 Wilshire Blvd., Los Angeles, California 90005. Telephone DU 8-3116. By Broadcasters—For Broadcasters. 11-68-tf

Wanted

WANTED: G. R. model 1181-A or Gates MO-2890 frequency monitor. State condition and price. Also one or more JK-57M crystal units. Eidson Electronic Co. Box 96, Temple, Texas 76501. 1-71-1t

Wanted — Technician experienced in maintenance of color control room equipment. Excellent benefits and working conditions. Salary commensurate with experience. Television station location East Tennessee. Send complete resume to Broadcast Engineering, 1014 Wyandotte, Dept. 248, Kansas City, Mo. 64105. 1-71-1t

Advertising rates in Classified Section are 15¢ per word, each insertion, and must be accompanied by cash to insure publication.

Each initial or abbreviation counts a full word. Upper case words, 30¢ each.

Minimum classified charge, $2.00.

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

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

Position Wanted

First Phone earned through formal training. Desire broadcast experience. Five years previous experience in tube and solid state troubleshooting. Single, ex serviceman, good health. Resumes, pictures available upon request. All replies considered. Wendell Moats, 5824 East Wash. Indpls., Ind. 46219. 1-71-1t

Services

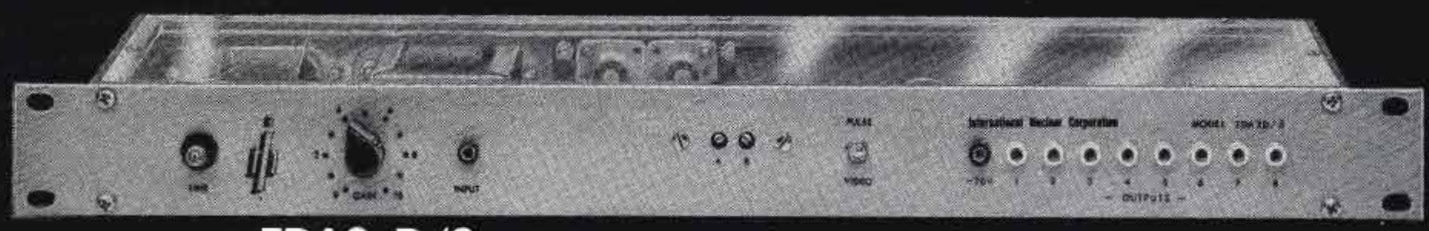
CRYSTAL & MONITOR SERVICE. Frequency change, repair or replacement of oven type broadcast crystals. Also frequency change and recalibration or repair of AM frequency monitors, and H-P FM monitors. Fast service at reasonable prices, 30 years experience! Call or write: Eidson Electronic Co. Box 96, Temple, Tx. 76501. Pho. 817 773-3901. 9-70-12t

Southeastern AM-FM-TV Station offers above average salaries for engineers experienced in AM-FM-TV Operation and maintenance. First Class License necessary. First Class Engineers without experience will be considered. Reply must be complete with references, photograph and salary requirements. Reply Dept. 241, 1014 Wyandotte Street, Kansas City, Missouri 64105. 10-70-4t

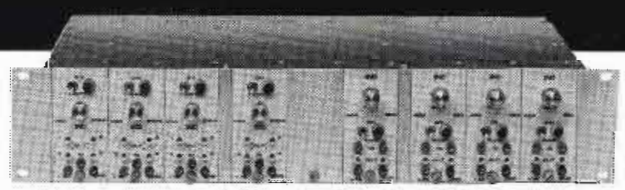
B. F. CUSTOM CASSETTE CARTRIDGE DUPLICATION. In cassette duplicating one to four channels. Editing master tape and pulsing for slide films. Storycraft Service Corporation, 18630 Detroit Avenue, Lakewood, Ohio 44107. (216) 221-4722. 1-71-6t

Our family is growing.

INC INTRODUCES A BRAND NEW LINE OF PRODUCTS...

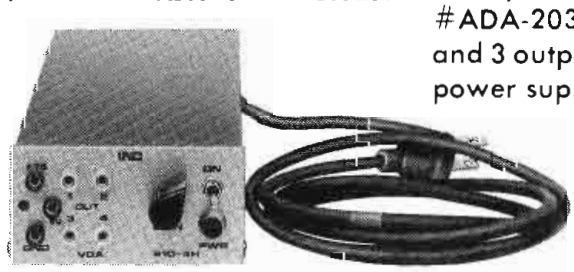


TDA2-D/8 Video/Pulse Distribution Amplifier
Solid-state, transistorized with differential input and 8 Video outputs. Replaces all tube-type amplifiers. The ultimate in professional efficiency to large and small operations at low cost.

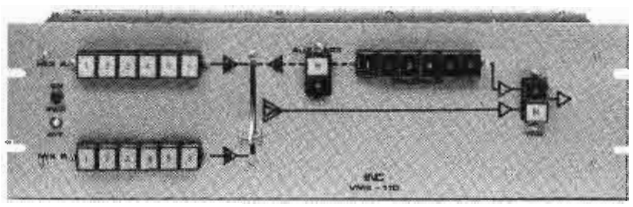


VDA-210-4 ADA-203 ADA-201

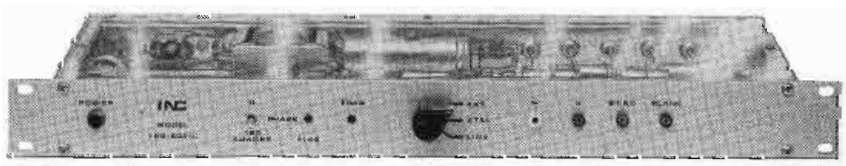
RFV-200-9 Video-Audio-Pulse DA configuration
Any combination of solid-state distribution amplifiers for Video-Audio-Pulse distribution. Video DA #VDA-210-4 meets specifications for both monochrome and color. Audio amplifier #ADA-201 is a universal line amplifier as well as microphone, booster, program or pre-amplifier. Audio #ADA-203 is for universal audio distribution with 1 input and 3 outputs. All units are self contained with regulated power supplies.



VDA-210-4-H
ADA-201-H
ADA-203-H
(Shown as self contained units)



VMS-110 Video Switcher
12 Video inputs (6 non-6 composite), 2 source terminated outputs; Program and preview, mixer/fader control for fade-in-out, lap-dissolve or super-impose two video signals with any desired degree of mixing.



TSG-502-LL Sync Generator
Monochrome Sync Generator designed for Broadcast, CATV, CCTV, ETV and small studio video origination. Switch selected for Ext. 31.5 KC, Crystal or line lock, or drive from INC Model TCS2 Color Standard.

INC
INTERNATIONAL NUCLEAR CORPORATION
608 Norris Avenue • Nashville, Tennessee 37204 • Phone 615 — 254-3365
Manufacturers of Video Broadcast Auxiliary Equipment

Circle Number 2 on Reader Reply Card

When you know what it takes to make a TEAC, you know why professional people wax lyrical about our A-7030.

This is a no-nonsense pro-quality tape deck, with unrivalled sound reproduction at 15 or 7½ ips. A streamlined solenoid control system for effortless operation. A system that makes cueing as easy as pushing a button. Automatic rewind and shutoff for built-in convenience.

The A-7030 is the sum of many systems, and the sum of our savvy in producing them. It's the head of our whole fine family of tape decks.

So if somebody wants to write a sonnet on it, we've got a great line for them.

SOUNDS LIKE POETRY TO THE PROS.

A-7030

- Dual-speed hysteresis-synchronous motor for capstan drive
- Two heavy duty 6-pole capacitor-start induction motors for reel drive
- Tape tension adjustment
- Massive inertial flywheel, over 1½ pounds
- Instant off-the-tape monitoring without interruption of recording
- Sound-on-sound and echo with simple external connections
- Built-in mike-line mixer
- Stainless steel panel reinforced with 13/64" aluminum base plate for assured stable performance

TEAC

TEAC Corporation of America
2000 Colorado Avenue
Santa Monica, California 90404

Circle Number 3 on Reader Reply Card