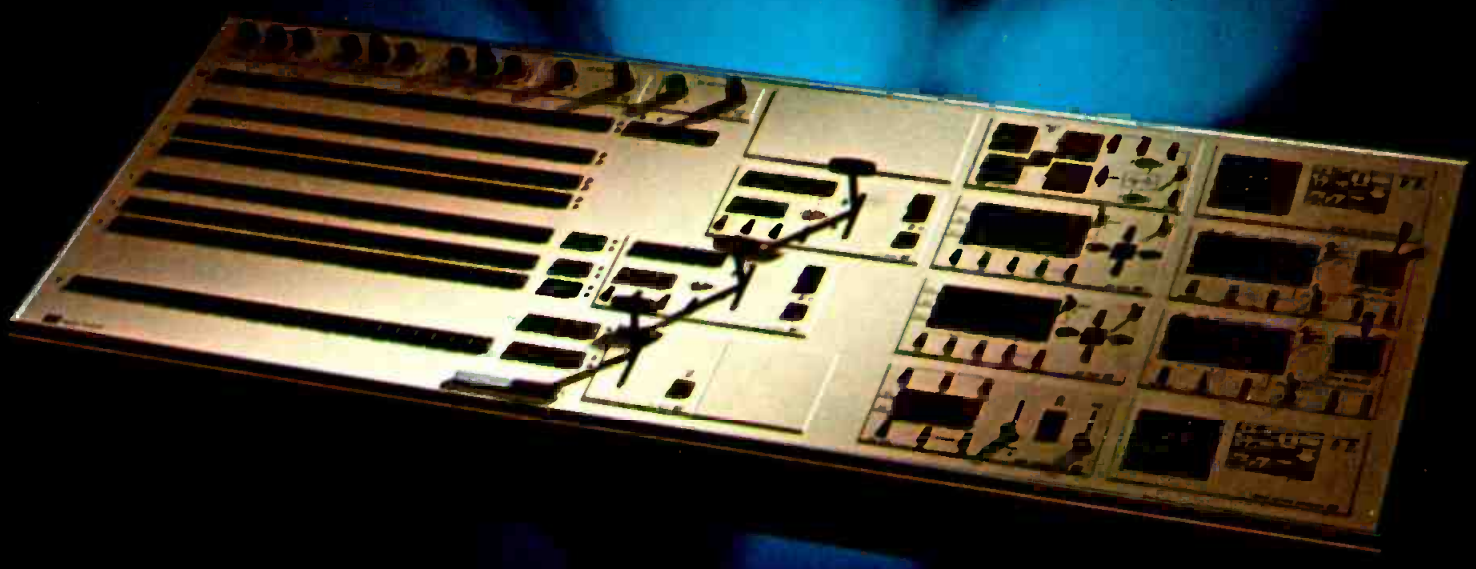
BROADCAST ENGINEERING®
April, 1976/75 cents

The VTR Revolution Continues

page 26

- *Small Market Workshop*
- *Transmitter Cures*
- *Sliding Into Accuracy*
- *Is U.S. TV Inferior?*

smart switcher



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BROADCAST ENGINEERING

The journal of the broadcast-communications industry *April, 1976 Volume 18, No. 4*

About The Cover

Our cover photos were taken during our visit with small market station WRMS, Beardstown, Ill. Article begins on page 40. Cover photos by Dennis Ciapura.

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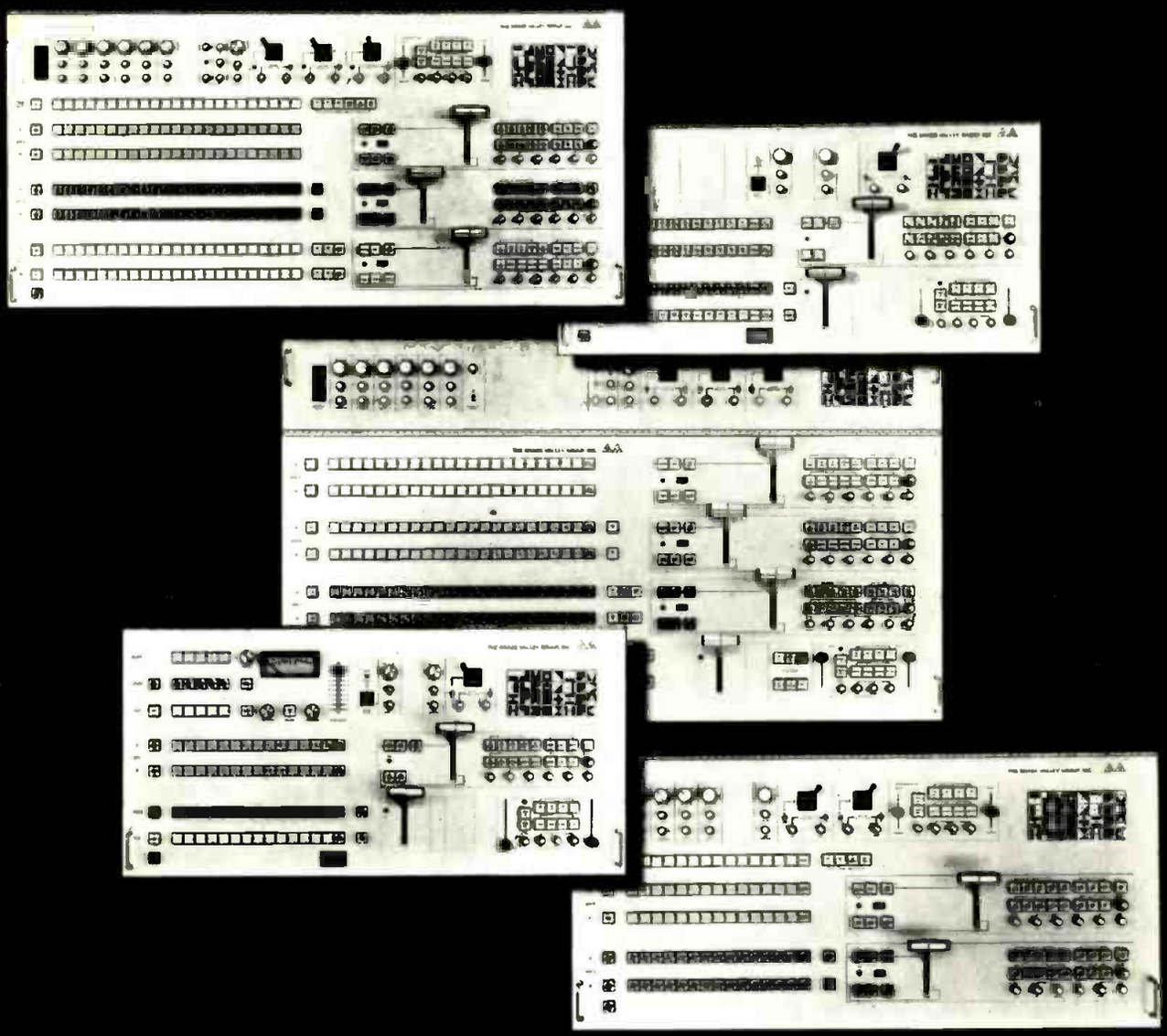

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DIRECT CURRENT FROM D.C.

April, 1976/By Howard T. Head and Harold L. Kassens

AM Antenna Sampling System Standards Adopted

The Commission has adopted new technical regulations establishing standards for the design and installation of sampling systems for AM directional antennas. The action brings to a close a proceeding instituted approximately three years ago.

The new regulations, first of their kind, describe the requirements of the sampling system in considerable detail. In addition to the existing requirement that the antenna (phase) monitor be type-accepted, specifications are established with respect to the type and length of sampling line, together with the fittings to be used with it and the routing of the line between towers and transmitter. The details of the sampling loops are spelled out and the circumstances under which current transformers may be employed in lieu of sampling loops are prescribed.

The new requirements will apply to all construction authorized after March 18, 1976. Existing stations are not required to rebuild their sampling systems, but for those who do on an optional basis, the licensee will be exempted from routine reading and logging of antenna base currents, and making monitor point readings more frequently than once a month.

FM Interference to TV Channel 6 Still a Problem

The Commission continues to grapple with problems involving FM broadcast interference to TV Channel 6 on a case-by-case basis. In a recent case in New England, the Commission authorized an educational FM station to shift to a lower frequency and increase power notwithstanding protests of interference to the Channel 6 TV station. The educational FM band, beginning at 88 MHz, is immediately in frequency above TV Channel 6 between 82 and 88 MHz.

The problem continues to grow as public agencies encourage the construction and expansion of public radio in the educational portion of the FM band immediately above the TV channel. In the New England case, the Commission conditioned the grant on non-interference to TV reception, requiring the FM permittee to establish that no interference was being caused to Channel 6 reception, and to install filters wherever such interference might occur.

(Continued on page 6)

We in the West welcome

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DIRECT CURRENT FROM D.C.

(Continued from page 4)

The Commission has two proceedings pending which if acted on could largely eliminate the need for case-by-case consideration of such proposals. A proposal in Docket 14185 issued almost ten years ago provides for a table of allocations for non-commercial FM stations. Action on this proposal was delayed for a time pending concurrence of the Canadian and Mexican authorities, but this has since been received. Likewise, a proposal in Docket 19183 inquiring into a wide variety of interference complaints, including this one, has lain without action for almost five years.

Inquiry Into TV Captioning for Deaf Expanded

The Commission has issued proposed rules which would permit the encoding of a signal on Line 21 of the TV raster to permit specially-designed TV receivers to display captions associated with the program. The system, developed by the Public Broadcasting Service (PBS), would provide visual captions for viewers with serious hearing impairments. PBS has said that over 13 million persons in the U.S. would benefit from the system.

The pending proposal would be applied on a voluntary rather than a mandatory basis. It is in addition to a concurrent proposal to require the captioning of emergency information notifications on all such messages on a mandatory basis.

Short Circuits

The Commission has eliminated rule provisions permitting the use of the International Digisonics Code (IDC) on TV commercials... An experimental authorization has been issued for AM operation on 530 kHz (see 7/75 and 12/72 D.C.) for the Walt Whitman Bridge across the Delaware River at Philadelphia...The proposal to expand the Class D Citizens Band from 23 to 50 channels has run into a snag because ten pairs of channels would have a frequency difference of 455 kHz, the AM standard I.F. ...The Commission has reminded TV licensees that the color burst should be deleted for monochrome transmissions except for brief inserts...A proposal has been made for a 10 kW station to operate on 160 kHz in the Washington, D.C. area to provide helpful information for Bicentennial visitors...The Commission has proposed relaxation of TV receiver tuner accuracy above Ch. 70 from ±1 kHz to ±2 kHz ...NAB has petitioned the Commission to permit 100 MHz in the 6 GHz band to be used on a shared basis with common carriers so as to provide ENG circuits...Don't sing it, Sam: The Commission has urged licensees not to sing or hum the weekly EBS test message, stating with stuffier-than-usual language that "musical rendition or alteration of the EBS test announcement does not adhere to the seriousness of the EBS program."

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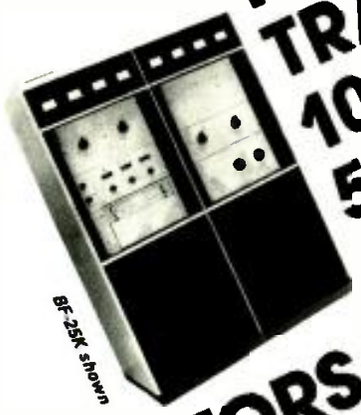

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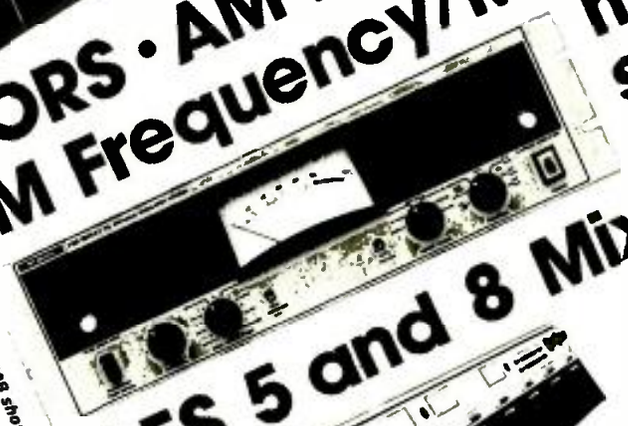

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INDUSTRY NEWS

Station ID's With Names, Too

The Commission has amended its rules concerning station identification announcements to permit the insertion of a licensee's name between the station call sign and the city of license.

The action was in response to a petition by Straus Communications, Inc.. seeking relaxation of Section 73.1201(b)(1) of the rules.

Straus contended that no purpose was served by literal adherance to the provisions of Section 73.1201(b)(1) which required that in station identification announcements, the station's call sign shall be "immediately followed by the name of the community or communities specified in its license as the station's location."

KGMI, Inc. supported Straus' petition, but also proposed that the FCC permit an insertion such as XXX "the sound of" anytown in the station identification announcements.

The Commission said that inclusion of the licensee's name in the identification would aid, not hinder, the informational purposes of these announcements. Moreover, it pointed out that grammatically, insertion of the licensee's name between the call letters and location would provide for a better flow than the licensee's name being mentioned after station location.

It said, however, insertion of a phrase like "the sound of" as KGMI sought, was material that has no function in terms of station identification, and would likely result in confusion. Moreover, it posed a problem in terms of Commission policy prohibiting inclusion of promotional material in these announcements.

In response to a petition by William E. Loucks seeking a requirement that the state as well as the city of license be required in station identification announcements, the FCC said such a requirement had not been shown to be necessary, but it encouraged such announcements in instances where they might be useful in avoiding confusion.

Drug Panels Are Planned

The Federal Communications Commission, in cooperation with the Federal Trade Commission, announced recently that three panels exploring the possible impact of televised over-the-counter drug advertisements on children, adolescents, and adults, are scheduled for May 20 and 21, 1976, at the FCC (1919 M Street, Northwest, Washington, D.C. 20554) to provide the agency staffs with information and guidance in future research projects. Each of these panels will consist of selected individuals whose names will be subsequently announced.

Two of the three panels will discuss existing research while indicating directions for future research on (1) the question of cause and effect relationships between televised over-the-counter drug advertisements and the misuse of such products by young children, and (2) similar questions concerning the role of televised over-the-counter drug advertisements and the illicit use of restricted drugs by elementary school children, adolescents, and adults. The third panel, in addition to discussing research needs, will consider various actions that could be taken by broadcasters, advertisers, manufacturers, Congress, various governmental entities, schools, and the general public should action be deemed appropriate.

Commission Adopts Sampling Rules

The Commission has adopted rules setting minimum standards for the installation and maintenance of sampling systems for antenna monitors at standard broadcast stations employing directional antennas.

(Sampling systems deliver samples of tower currents to antenna monitors which provide indications for the radio operator of the relative phases and amplitudes of the currents in the elements of a directional array of an AM station. The information is needed to ensure proper maintenance of the radiation pattern in order to minimize interference to other stations.)

The new rules, which become effective March 18, will apply to new stations, stations making major changes and stations incapable of maintaining their directional antennas in adjustment, where some portion of the difficulty can be attributed to inadequacies in the monitoring system.

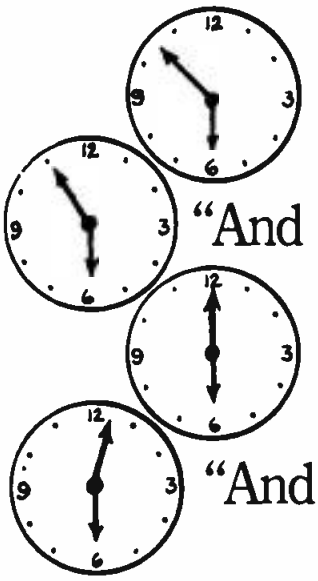
The action terminated a rulemaking proposal begun February 21, 1973, to determine what constituted the basic elements of an adequate sampling system and the feasibility of promulgating minimum standards for its design and installation.

The Commission noted that on January 10, 1973, in Docket 18471, it adopted rules providing for the type approval of antenna monitors and established June, 1, 1977, as the date by which all standard broadcast stations employing directional antennas will have to abandon obsolete monitors of questionable accuracy and be equipped with stable, accurate and easily manipulated instruments of modern design.

The Commission said the current proceeding was the final step toward ensuring that the performance of directional antennas will be adequately monitored.

The rules adopted govern the design and installation of sampling systems and relax certain logging requirements for those stations employing sampling systems meeting the minimum standards prescribed.

(Ten minutes in the life of a pulse count news editor)



"And now for the 6:..."

"And now for the 6:00 O'clock..."

"And now for the 6:00 O'clock ne..."

"And now for the 6:02 O'clock news?"

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FCC releases FM study results

On December 4, 1975, the Commission formally reopened the rule-making proceeding concerning the use of clear channels in the standard broadcast band. This action was taken with the expressed intention of seeking a final resolution of this issue with due regard to present-day conditions and current Commission policies.

To facilitate these efforts the Commission recently contracted the Office of Telecommunications (OT) to carry out a study of coverage areas for all FM stations currently operating in the continental United States. This study was done in order to determine the number and location or residents in this country who do not enjoy primary aural service during the nighttime hours.

The Office of Telecommunications was instructed to develop two sets of coverage maps; the first designating station contours at a signal strength of 1 mv/m and the second designating contours at a signal strength of 50 uv/m. Both sets were developed using the Commission's standard propagation model.

The OT study now has been completed. The results indicate there are approximately 150 counties, with a total population of less than 2 million persons, located beyond the reach of FM stations. Additionally, the results indicate that all such counties are located in the western half of the U.S. These findings are based on the assumption that a signal strength of 50 uv/m is sufficient to assure adequate reception of FM service. Maps designating the coverage of FM stations now are available for public inspection in the Commission's public reference room at 1919 M Street, N.W., Washington, D.C. 20554. They may be viewed during normal business hours (i.e. 8 A.M. to 4:30 P.M., Monday thru Friday). It is hoped that the availability of this information will facilitate the Commission's efforts to determine the best possible use of clear channel frequencies.

FM channel study available

The Research and Standards Division of the FCC's Office of Chief Engineer has released a report "FM Broadcast Channel Frequency Spacing".

Written by Harry Fine and George Sharpe, the report studies the effect of reducing the adjacent channel frequency offset from the currently used 200 kHz to 150 kHz and to 100 kHz. The analysis shows that both the 100 kHz offset, with a receiver filter, and the 150 kHz offset, with no filter, are more efficient in population and area coverage efficiency than the 200 kHz offset for both stereophonic and monaural operation.

A limited number of copies of the report—FCC/OCE RS 75- 08—are available for public distribution in Room 7202, 2025 M Street, N.W., Washington, D.C. 20554.

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Battery or AC powered and with full production control either remotely or at the backpack, the LDK-11 has all the key Philips engineering features that make it like no other comparable camera in the world. These features include Philips famed 3-Plumbicon* tube picture, beam-split prism with bias light and Philips linear matrix for superb colorimetry. Also included are H & V contours, auto iris, auto white balance, genlock sync generator, switchable gain and gamma, built-in color bars, remote VTR and zoom controls, and two audio channels.

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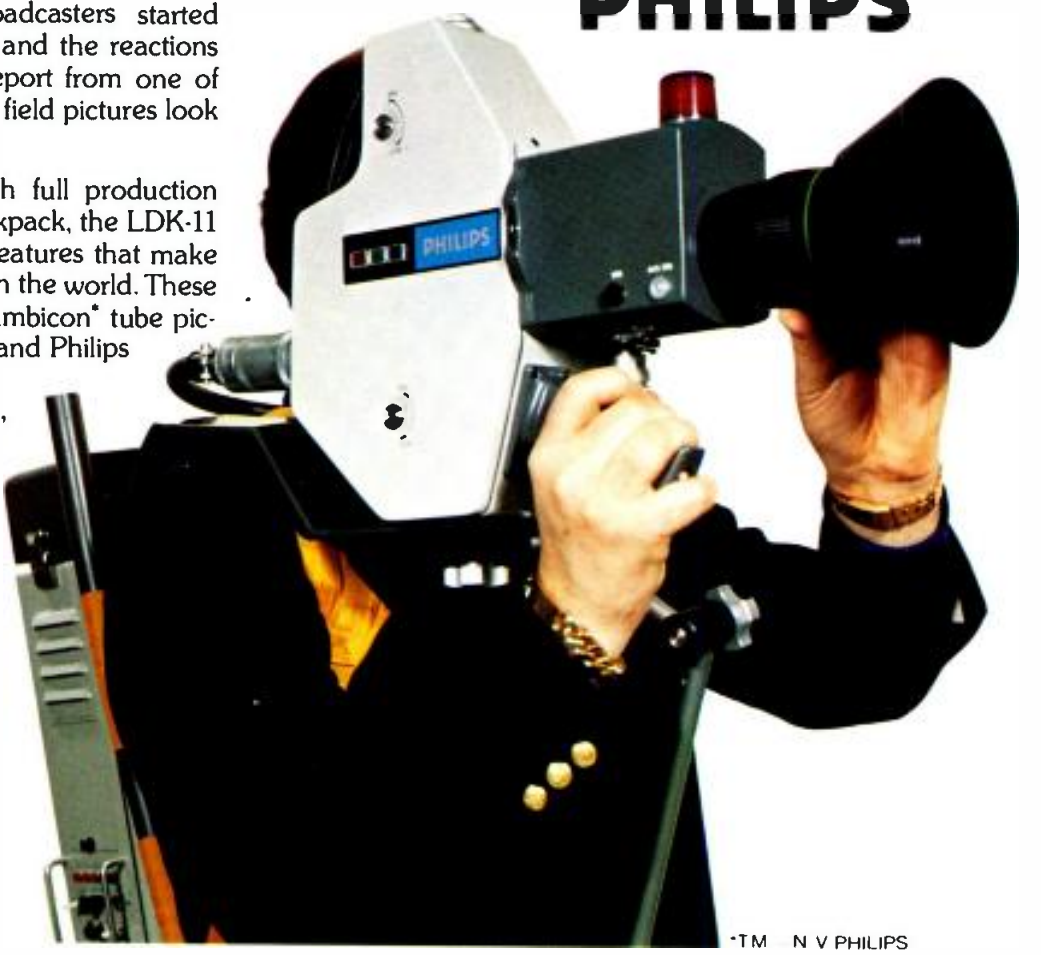

*TM N V PHILIPS

Jazzed up EBS Needs clarification

Occasionally the Commission receives reports of broadcast stations transmitting Weekly Off-The-Air Monitor Tests (73.961(c) in a "Jazzed Up" or singing manner.

With the advent of the new two-tone EBS Attention Signal, the use of singing or "Jazzed Up" Test Announcement Procedures must be clarified.

The Emergency Broadcast System was established to provide an emergency network capability for the President to communicate with the public during emergency situations and, in some instances, may be activated for the benefit of state and local officials in connection with severe weather and other types of day-to-day emergencies. Part 73.961(c) of the Commission's rules state, "Weekly Off-The-Air Monitor Tests will be conducted by all AM, FM and TV broadcast stations once each week between the hours of 8:30 AM and local sunset. These tests will be conducted in accordance with procedures set forth in the EBS Checklist furnished to all broadcast stations."

While the above regulation, along with the procedures set forth in the EBS Checklist, does not specifically prohibit the addition of any music, humming, background noise, etc., to the test message, the Commission is of the opinion that any form of a musical rendition or alteration of the EBS Test Announcement does not adhere to the seriousness of the EBS program.

The Commission wishes to emphasize the importance of the EBS, wherein it provides the general public with a reliable medium with which to acquire accurate and concise information, in case of any emergency situation.

The Commission urges broadcast stations to voluntarily refrain from transmitting EBS Test Announcements in any of the above mentioned formats.

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Maximum relative aperture	1:1.6 (f=12-172mm) 1:2.0 (f=216mm)	1:2.1 (f=16-230mm) 1:2.7 (f=288mm)
Zoom ratio	18x	18x
Image format covered	12.8 x 9.6mm; 16.0mm dia.	17.1 x 12.8mm; 21.4mm dia.
Minimum object distance from front vertex	0.7m (27.6")	0.7m (27.6")
Object dimension at minimum object distance: Wide:	103.2 x 77.4cm; 129.0cm diameter	
Tele:	5.3 x 4.0cm; 6.7cm diameter	
Back focal distance	62.65mm (in air)	78.08mm (in air)
Glass compensation	69.2mm (BK7)	70.2mm (BK7)
Wavelength range for color correction	400-700nm	400-700nm
Weight	23kg (approx. 50 lbs.)	23kg (approx. 50 lbs.)
Dimensions	466.5mm length x 284mm width x 260.5mm height	
Focus and Zoom control	Manual, with plug-in interchangeable servos	
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*Reg. T.M. of N.V. Philips of the Netherlands

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COMMUNICATIONS AND INFORMATION HANDLING

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

Certification Program

There will be no blanket mailing of the Certification application packets to the membership. Engineers interested in taking the exam should simply write to the National office and request an application form. Similarly, all candidates who want to be Certified under the Grandfathering Provision should make the same request. Consideration for extending the Grandfathering Provision past the previously designated June, 1976, cutoff date, will be taken up at the SBE Board meeting in Chicago during the NAB Convention. Please look in your post-convention copy of **The Signal** and the May SBE column in *Broadcast Engineering* for that decision. The SBE address is: *P.O. Box 88123, Indianapolis, Indiana 46208, attention: Vince Flanders, Certification Secretary.*

Attention, All Members

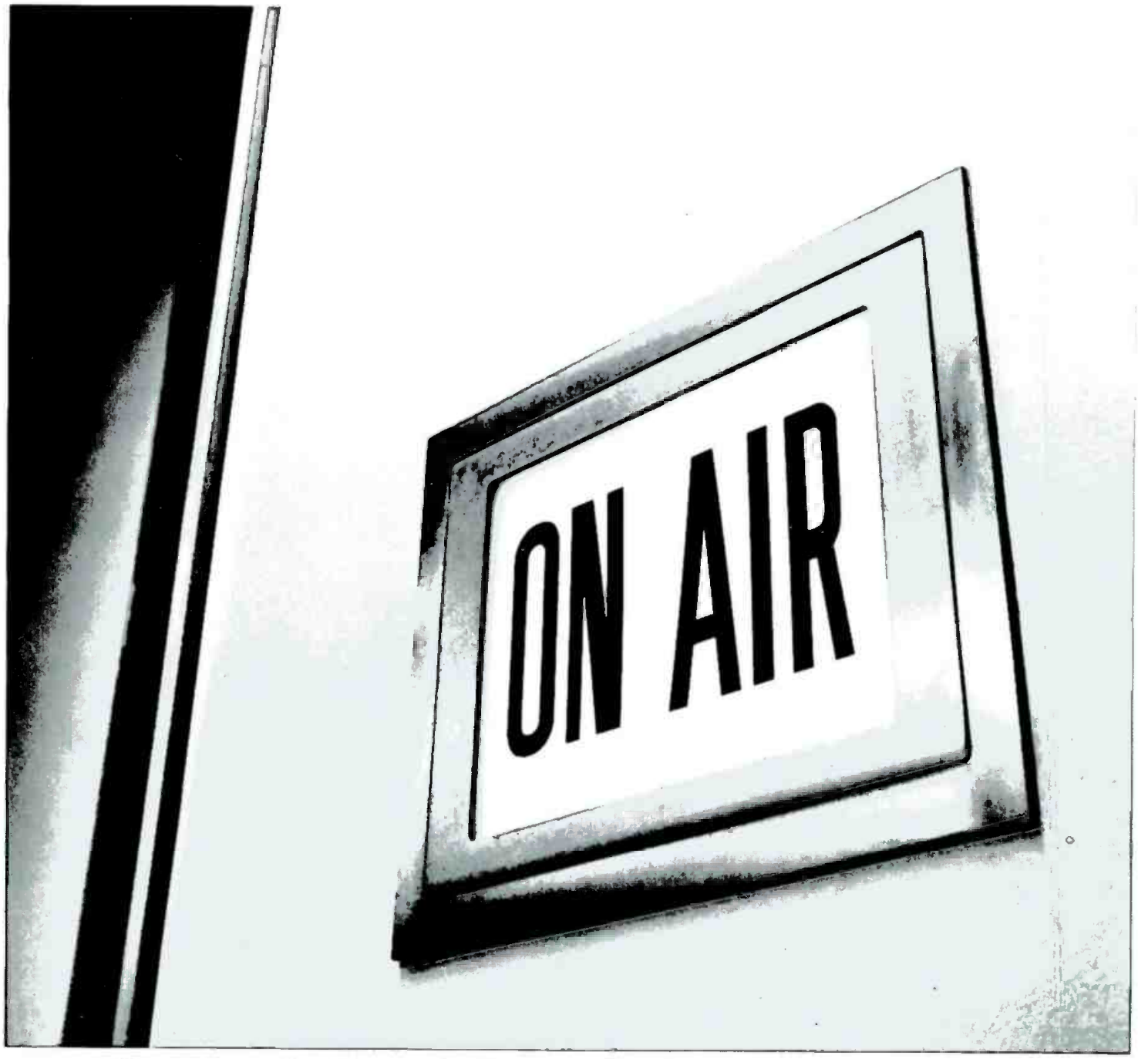
There are many among you who may be eligible for an upgrade in membership. If, for instance, you are an Associate Member and have received your First-Class license (or the equivalent), or perhaps hold Member status and are eligible to become a Senior Member, contact Vince Flanders. He will send an application form, which will be reviewed, upon receipt, by the Admissions Committee, and will then mail a new certificate indicating your new grade of membership. There is no charge for this procedure unless you are a Student Member and upgrade to a Member standing. Then you must pay the difference in membership fees.

In both the SBE Directory and the new SBE stationery, the address for **The Signal** office in Washington, D.C., is listed incorrectly. Please note that it should read *2000* N Street, N.W., etc., not *200* N Street. There is, indeed, a 200 N Street in that city, and the homeowners may not be interested in your newsletter correspondence.

Assistant Secretary Vincent Flanders announces that the printer in New York mailed both the special issue of **The Signal,** and the SBE directory during the second week in February, and members should have received them by now.

(*Continued on page 20*)

Notice!
SBE Application Form Is Printed On Page 23 For Your Convenience



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Our new division was set up to make your life a lot easier, and to keep you "on-air" more dependably. It's ready to start doing it. Now.

For full information, check with your RCA Distributor or contact RCA Distributor and Special Products Division, Bldg. 206-2, Cherry Hill Offices, Camden, New Jersey 08101.

In Canada, contact RCA Limited, Distributor and Special Products Division, Sainte Anne-de-Bellevue, P.Q.

RCA

Distributor and Special Products Division

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Ampex AVR-3. The

Two decades ago, Ampex introduced the first videotape recorder, and now Ampex opens a new generation of VTR capability with the all-new AVR-3, the machine that thinks for itself.

You'll want an AVR-3 for a couple of basic reasons: for the "intelligent" way it does an outstanding job for you, and for the superb pictures it makes. In *any* broadcast band it delivers superior picture quality. With Super High Band Pilot you have the most foolproof record/playback technology available.

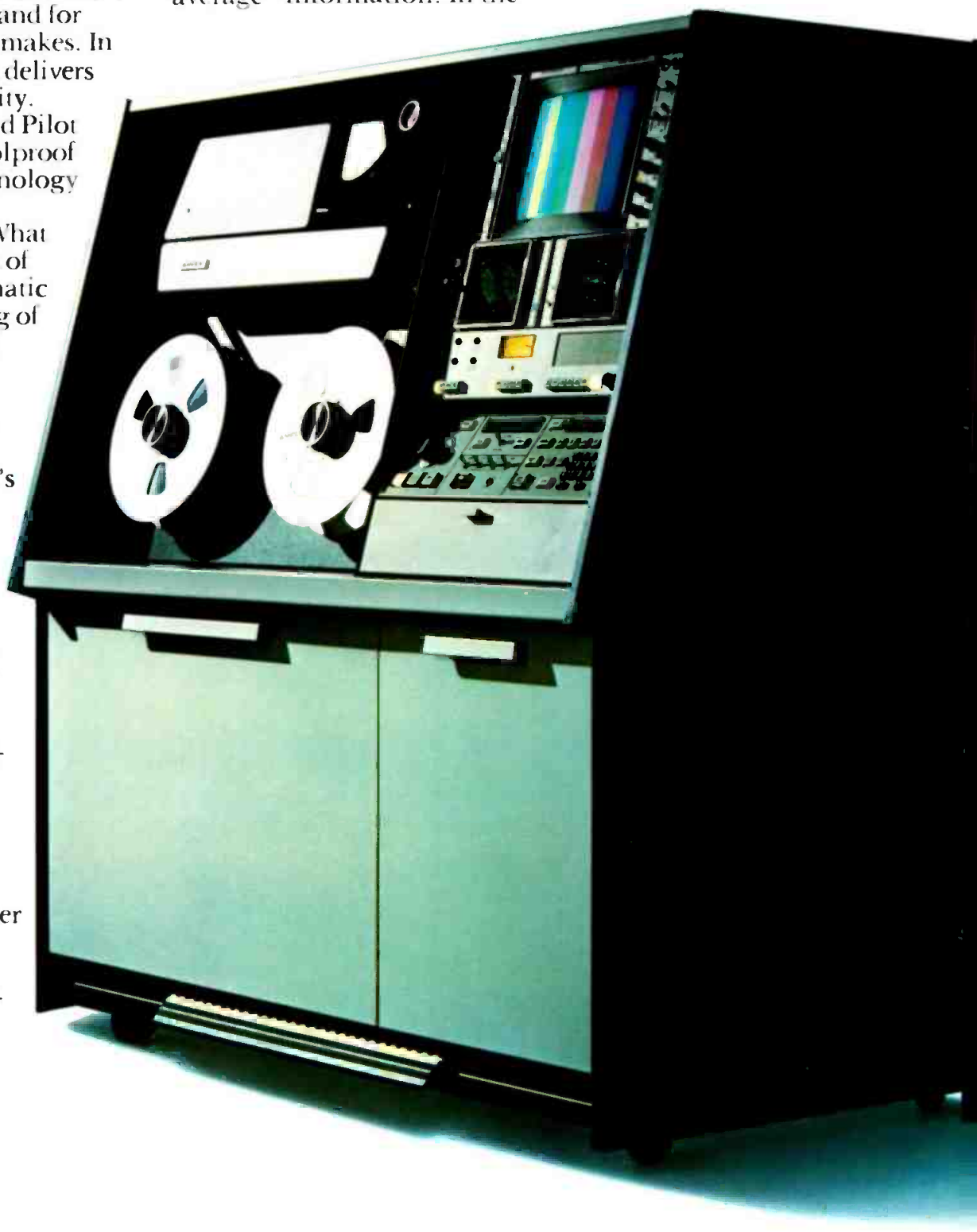
"Intelligent." What does it mean? It's a lot of things, such as automatic sensing and switching of speeds and bands. It's an all-new optional Edit Controller for teleproduction capabilities that once seemed impossible. It's fast, efficient, gentle tape handling. And much more.

There isn't anything in the world like an AVR-3. It produces unequalled pictures; it protects you against errors in playback settings; it provides the easiest and best editing you've ever known; it's going to give you longer service life than any other VTR you've ever owned. AVR-3 is the best recording investment on the market.

Super high band pilot

The Mouthful That Becomes An Eyeful.

How does a VTR compensate for signal irregularities introduced during the recording phase? In the past, those corrections were made on the basis of "average" information. In the new AVR-3, with Super High Band Pilot, signal correction is triggered on a continuous basis. Color velocity errors and equalization variables are "seen" and corrected before they can be displayed. The result? Perfect pictures. You can see the difference.



First "Intelligent" VTR

With Super High Band Pilot, you'll get a picture at 7½ inches per second that's virtually as good as you've learned to expect from 15 ips High Band. Half the tape speed means half as much tape. It's a money saver.

Recording options

When you order your AVR-3, you'll be able to choose one of the following pairs of recording bands: Super High Band Pilot/High Band; High Band/Low Band Color; Low Band Color/Low Band Monochrome. And no matter which pair of bands you specify, you'll get both 15 ips and 7½ ips speed capability.

"Intelligent"

Putting the Brain to Work.

The first thing you'll notice about your new AVR-3 is the way it "knows" how a given videotape was recorded. It'll automatically sense the recording speed and the band you used, and will switch to the right playback configuration. Intermixing tapes won't be a problem, because the AVR-3 always knows how to sort them out.

The second feature you'll notice is the way your AVR-3 handles tape. Punch up a fast shuttle, and AVR-3 programs the acceleration from a gradual start to speeds up to a flying 375 ips. Then, as the tape approaches end-of-reel (or a cue point), the program takes over again, producing a smooth deceleration curve to a precise, dead stop. You'll never damage a tape as you run it back and forth, time after time, on an AVR-3.

Editing

If You Can Imagine It, You Can Accomplish It.

The standard AVR-3 editor permits manual insert and assemble edits. If your needs are simple, you can stop right here.

The optional Edit Controller takes you the rest of the way. Using either time code or tape timer information, it includes search capability. This feature gives you separate video and audio edit points, and the keyboard control allows you to move or enter edit points at will.

There's more. An optional color framer eliminates *all* color ambiguities between edited segments. A time code generator and reader and a character generator are other handy options.

Housekeeping and computer control

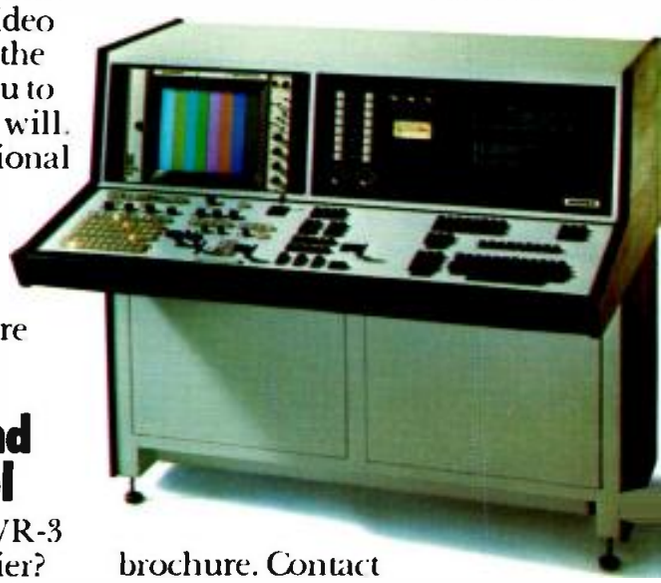
What else does the AVR-3 IQ do to make your life easier? Once the video and audio edit points are keyed in, Edit Controller takes over the housekeeping. It automatically computes and controls pre-roll addresses, acceleration/deceleration profiles, synchronizing information, and all switching necessary for precise edits. An optional computer interface lets you work with any external editing system, such as the fully computerized Ampex EDM-1.

Economics

Good at First, Better Every Year.

Even the basic AVR-3 model will outperform most previous top-of-the-line VTRs. And no matter how you equip your AVR-3, it'll cost less than you'd expect and then pay for itself with many years of reliable, professional service.

Complete technical data and performance specifications are now available in our AVR-3 brochure. Contact your Ampex Video Sales Engineer, or write us for your free copy.



AMPEX

Ampex Corporation
Audio-Video Systems Division
401 Broadway, Redwood City
California 94063, (415) 367-2011

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(Continued from page 16)

SBE Membership Application

This month's issue of *Broadcast Engineering* contains a copy of the SBE membership application. Even if you already belong, you may want to clip it out to pass on to a friend who may be interested in joining. At the same time, why not acquaint him with the objectives of the Society of Broadcast Engineers: (1) to share and increase knowledge in the field of broadcast engineering, and to promote the advancement of this, and related, sciences; (2) to establish standards of professional education, training, and competence for broadcast engineers, and to professionally recognize the achievement of these standards; (3) to stimulate interest in broadcast engineering, and to encourage the exchange of ideas among its practitioners; (4) to create a working alliance with other organizations affiliated with broadcasting, with emphasis on the interests of the listener; and, (5) to hold meetings for learning and discussing professional advances, and to promote additional activities which fulfill the purposes of this Society.

SBE CHAPTER MEETINGS

Chapter 9: Phoenix, Arizona

Chapter 9 met February 24 at 7:00 p.m. at KAET in Tempe. Pete Bernstein and Kaas Vanderkyle of Amperex demonstrated a complete setup of the Plumbicon tube. (*Leon Anglin, Chairman, SBE, P.O. Box 615, Phoenix, Arizona 85001, (602) 285-7333*).

Chapter 11: Boston, Mass.

The Boston SBE Chapter met on Wednesday, February 18, at Microwave Associates in Burlington, Mass. Following an organizational meeting, Mr. Dan McCarthy and Mr. Frank Miani gave a test demonstration of a multi-hop microwave video and audio system. (*Bob Molloy, Chairman, 66 Bellevue Street, Manchester, New Hampshire 03103, (603) 669-1250*).

Chapter 15: New York, N.Y.

On February 12, members of Chapter 15 met to hear Mr. Leonard Kahn of Kahn Communications, Inc., Freeport, New York. Mr. Kahn spoke on AM stereo, using a conceptual approach in his discussion which included a practical demonstration of the system. A question-and-answer period followed. (*John Lyons, Chairman, WWRL, 41-30 58th Street, Woodside, New York 11377, (212) 335-1600*).

Chapter 16: Seattle, Wash.

The Seattle Chapter held a special evening meeting on February 11 to give everyone plenty of time to tour the KSTW-TV studios. Members reported that the facility was indeed impressive.

Also, Chapter organizers are working on a Regional Convention. Tentative dates are May 26-27, at the Sherwood Inn in Seattle. Among the early participants scheduled are: Ampex, IVC, RCA, and several well-known local distribu-

(Continued on page 22)

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Keith K. Ketcham (signature)
Chief Engineer
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SBE

(Continued from page 20)

tors. (*Bob Ingalls, Chairman, 5441-187th Avenue, N.E., Redmond, Washington 98052, (206) 543-7774*).

Chapter 17: Minneapolis/St. Paul, Minnesota

On February 17, SBE members and their guests met in the Rarig Center at the University of Minnesota to hear Mr. Robert Seaburg, field engineer for Tektronix, give a demonstration of the Tektronix 1440 Automatic Video Corrector. Mr. Seaburg also brought two 650 picture monitors, a VTR deleter-inserter, a R146 sync. generator, a 1480R waveform monitor, and a R520A vectorscope for members to inspect at the meeting. (*Lance Raygor, Chairman, Route 1, Box 337, Chisago City, Minnesota 55013, (612) 373-4807*).

Chapter 20: Pittsburgh, Penn.

Members of Chapter 20 invited Mr. Terry Lloyd, of Time and Frequency Technology, Inc., to their regular noon meeting on February 19. Mr. Lloyd gave a slide presentation on their new two-tone EBS system which complies with the FCC Rules which just went into effect April 15. (*Jim Hurley, Chairman, WTAE-TV, 400 Ardmore Blvd., Pittsburgh, Pennsylvania 15230, (412) 242-4300*).

Chapter 22: Central New York

The February program for Chapter 22 featured a presentation by Bob Griffiths, of Telemet, who spoke on the parallel development of TV broadcasting and test equipment. Also, Mr. Alex Kwartiroff, Telemet director of engineering, discussed the application and use of TV demodulators and brought along one of their newer devices—a synchronous detector for TV demodulators.

In March, Mr. Terry Lloyd, of TFT, conducted an evening program on EBS: its purposes, interconnection, and operational procedures, plus a view of the TFT EBS gear.

Tentative scheduling shows that Chapter 22 invited Ampex to their April meeting to cover the subject of video data storage, and in May, Tektronix will present the evening's

(Continued on page 70)

SOCIETY OF BROADCAST ENGINEERS, INC.
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Enclose $15.00 (or $7.50 for bona fide students). No action taken without Dues.

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I agree to abide by the Constitution and By-Laws of the Society if admitted.

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From BLUE BANANAS to SAG TAILS

Blue Bananas welcomes a twist or two from Edd (that's right, Edd) Monskie, the CE at WRBJ, St. Johns, Michigan. Edd writes that during his stay at WBST-FM, Muncie, Indiana, one of the newscasters fell into the old outcue trap.

One of the newscasters didn't remember to stay quiet after giving the outcue to his newscast. After giving the cue to the operator, he said to himself but out loud, "That was the _____ newscast I've ever done," only to discover that the board operator had left the mic on and his passing thought became a slice off the old blue banana.

One time I was helping co-anchor a half-hour newscast with a voluptuous blond. Her low, sexy voice almost equalled her physical appearance. The outcue of the news was pre-written with the names filled into blank spaces.

During the course of the news, our order was mixed up, so she ended up concluding the program, which was my ending. It ended with her saying, "I'm Edd Monskie with...." She finished the news exit professionally without even flinching, while another engineer and I were literally rolling on the floor with laughter.

Of course the wire services slip on the old peels, too. One wire summary told of how a Senator from Florida was being indicted for accepting $10,000 worth of "brides".

Edd ends with a recent live, slippery short spot that should have been "Spartan Pot Pies" but went on the air as Spotan Part Pies.

The Trouble Is...

Closed mics that come open in the night have always been a source of trouble. A simple way to cut down this possible problem is to tie indicator lights to the switching circuits.

Girls, Girls, Girls, Yes, We Had Girls!

Our next item in the Blue Banana bunch comes from Danville, Illinois. We'll let Bud Sunkel tell his own story. It goes something like this:

This was in the late 1940's, early 1950's...when RADIO was RADIO. When PERSONALITY meant more than TIME AND TEMPERATURE, "and get it all said in ten seconds or less". I was the Sign-on, morning Personality DJ on WDAN, Danville, Illinois.

In those days, after a three hour DJ stint, you were bushed...you had to work, new material, some research, because people either listened or turned it off...with radio there was no "grey" it was black or white...you had ears and imagination...no tube to look at. But also in those days, in a small market station, and small staff, the "personality" man became a staff announcer for the balance of an eight hour work day.

In time, after my show, I found that during the 9 a.m. CBS news, I could catch up my program log... put away my records, wash my coffee cup, and be free to do one of two things...listen to Arthur Godfrey for 90 minutes and Oxydol on Stella Dallas, or go to where the action was...and the office girls, up in the carpet rooms. They all came in at 8:30 a.m. but by the time they removed snowboots, coats, combed hair, updated last night's activity... they were ready for work by 9:00 a.m. too. Also, by this hour, Management had "hit the streets" apologizing for my errors of the morning...or the local doughnut shop...personally I didn't care, as long as they got on their way to permit me to be a "big man" with the girls in the front office. Arthur Godfrey was good for 28 minutes, 30 seconds per session, and with practice, I could ricochet off the walls and make it from the front office to the control room in 3.4 seconds...some of my handprints are still imbedded on the walls of WDAN.

Also, back in those days, holidays were celebrated on the actual anniversary of the event...such as Memorial Day...remember? Eleventh month...eleventh day...eleventh hour.

So at 10:00 a.m. my time, 11:00 EASTERN TIME I rejoined Arthur Godfrey and started my mad dash, obstacle course back to the carpeted front office while Arthur Godfrey was saying....

"How-Areya. How-r-ya....Since this is Memorial Day, what say we pause for 60 seconds in memory of this important day, and each of us, in his own way, take one minute of silence to say a prayer"...At this time, I started part two of a hot new joke, and only heard the dead, cold silence coming from the speaker in the hall....CBS must have gone dead. In my normal, or better speed, I got back to the Control Room to break in on the silence and blurt out.... *"We have lost our network...please stand by.. we will return to Arthur Godfrey as soon as technical difficulties are corrected"*...Music up and under....

Also, last visit to front office...no more mad dashes...and ya know, I found out, by necessity, Arthur Godfrey did do a pretty good show....I heard every one from that day on....

Send your Blue Banana to Blue Bananas, The Editor, Broadcast Engineering Magazine, 1014 Wyandotte, Kansas City, Mo. 64105.

CSI

FM BROADCAST TRANSMITTERS

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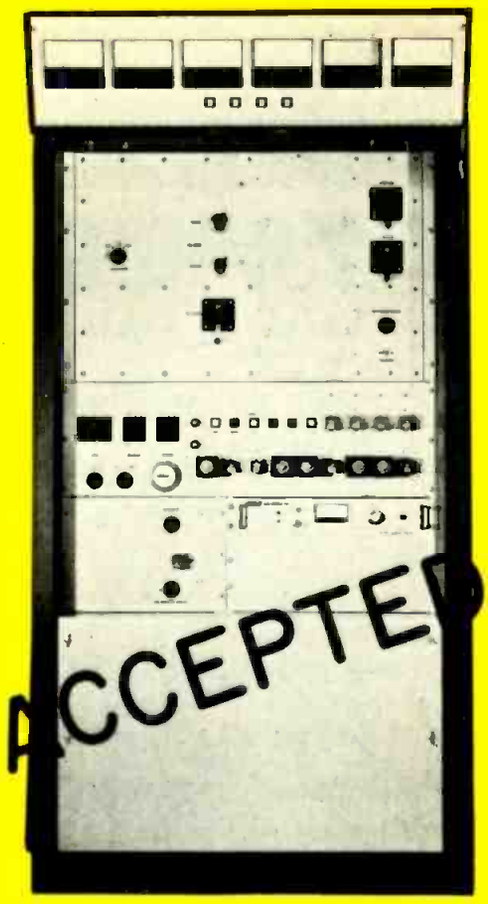

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Video Tape Recorders:
A never ending revolution

Part 1 of a 2-part series/By Joe Roizen

The annals of science and industry are littered with the writings of two types of people, the thinkers and the doers. While conception obviously predates construction, there is no shortage of instances where the conception alone, although recorded in some periodical, is not reduced to practice and someone else, either simultaneously or at a later date, finally creates the device in question.

Video recording also had its thinkers and a diligent search of old patents and long forgotten books yields a few of these early concepts. It almost seems as if one searched far enough, one could find a crude drawing made by Leonardo da Vinci proposing a means of committing images to a medium.

The earliest chronological proposal for the use of magnetic recording to store pictures was found by the author in a book titled, "Handbuch der Bildtelegraphie und des Fernsehens" which was published in Germany in 1932, and which describes a series of schemes for picture telegraphy proposed by Dr. Fritz Schroeter, professor at the Berlin Technischen Hochschule and a director of Telefunken. The illustrations in the book quite clearly resemble present day transverse and helical scanning formats which are used currently for video recording on tape.

Some of these proposals date back to the late twenties, a period during which the British patent office also issued a patent to Boris Ritcheouluff of London who designed a picture recorder of considerable ingenuity based on the Valdemar Poulsen machine developed in Denmark at the turn of the century.

In 1938, an Italian inventor by the name of Luigi Marzocci filed a patent application for a variety of rotary head recorders which were clearly intended for sound recording and so labelled in the patent. Nevertheless, the drawings are so amazingly similar to the arcuate and transverse video recording concepts which came later that the company which held the rights to Marzocci's invention were prompted to consider legal action against Ampex after they commercialized their VTR.

Even as the Ginsburg group were developing th transverse recorder, a German engineer by the name of Eduard Schueller, working in Hamburg for Telefunken, filed for a patent on the 30th of June 1953 covering a two head helical recorder that is almost identical in concept to a few of the machines that were later produced in America, Japan and Germany.

There was an air of normal conviviality among the 200 station owners and managers attending the CBS television affiliates meeting that preceded the opening of the National Association of TV Broadcasters convention in the Conrad Hilton Hotel in Chicago. As the delegates filed into the Normandy Lounge to listen to their headquarters manager, William Lodge deliver the annual report, they had no inkling that this April 14, 1956 meeting would expose them to one of the most unusual technical developments which would significantly alter television from that day forward.

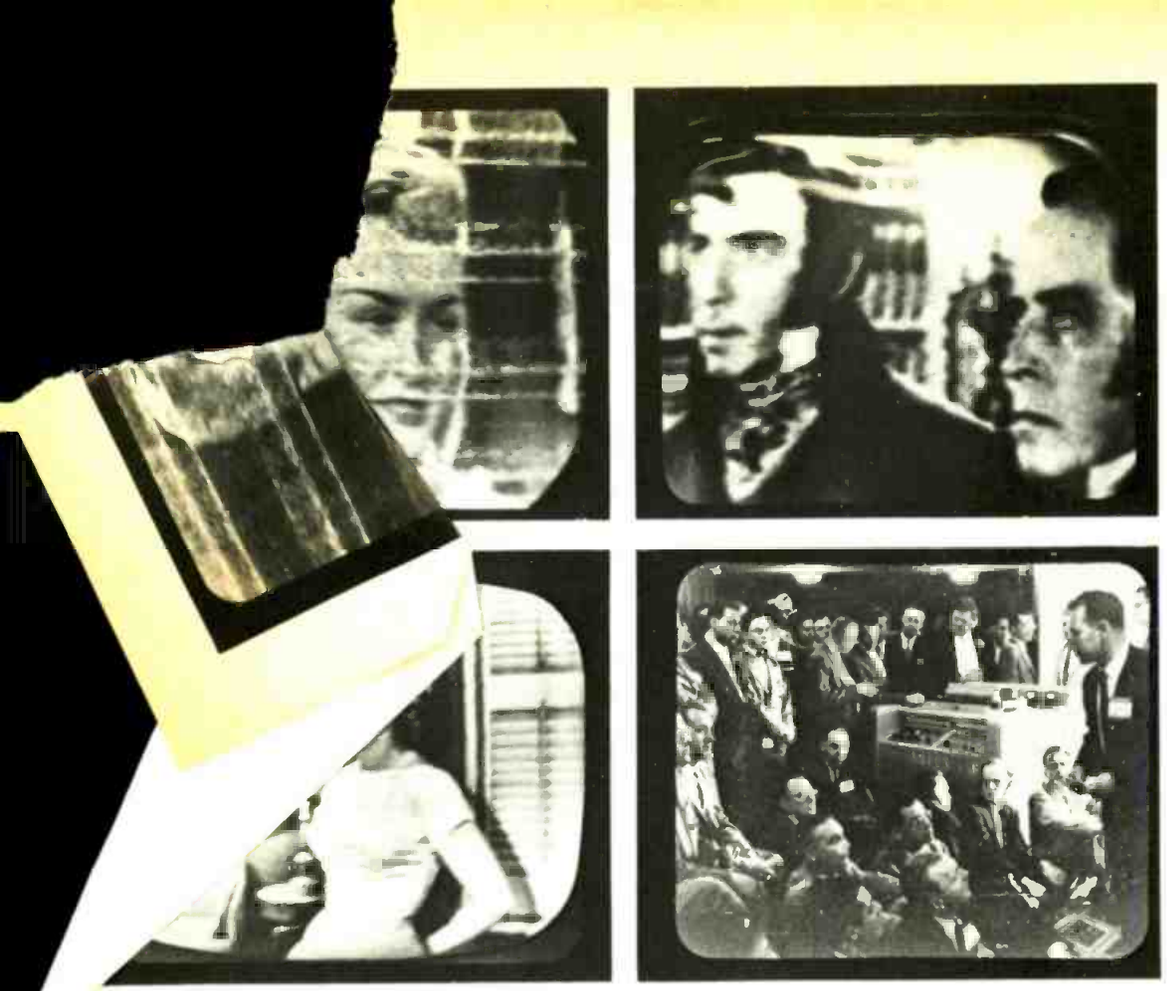
It was not out of the ordinary at such gatherings to have a camera pointed at the podium and a few monitors set up in the room so as to convey the aura of television. If any of those in attendance noticed an unfamiliar high pitched whine, they probably assumed that it was due to a faulty fluorescent lamp or some external machinery.

Bill Lodge made his prepared presentation with what seemed like a pregnant pause at the end. Suddenly, the monitors in the room were showing what must have seemed to the audience as an impossibility, for they were looking at an instant playback of the Lodge speech, with an image clarity indistinguishable from the original they had seen a few minutes earlier. There was a hushed silence as those in the room tried to relate this assult on their senses, with their a priori knowledge that TV images could not be immediately repeated by any known device.

As the impact of what was happening before them sank in, the silence was broken by an equally sudden roar of applause, cheers, whistles, and stamping of feet. The curtain behind the podium opened to reveal a large gray console that looked like a gargantuan audio tape recorder, with overgrown reels of tape on its horizontal top plate.

This article is the first part of a 2-part series giving special insight into the history of VTR's, a history that began to unfold twenty years ago this month.

This series is a condensation of a paper Mr. Roizen delivered at the Sir Isaac Schoenburg Memorial Lecture for the Royal Television Society.



This set of photographs represents some very early pictures coming from tape. The upper left is from the first FM system, and there is plenty of distortion evident from banding effects. At top right is a better result obtained with an improved blanking switcher and better heads. Bottom left is the quality of the image coming from the first NAB machine in 1956. Bottom right wasn't really on any screen, but it does depict the setting 20 years ago when the VRX-1000 was introduced at the Conrad Hilton.

Hovering over this whirring magnetic monster, with looks of obvious relief, were a few of the engineers responsible for developing it.

With the presentation over, the normally staid and dignified executives from television stations all over the country crowded in around the VTR, trapping the operating personnel against the machine, while they pushed, elbowed and stood on chairs to get a glimpse of this latest video marvel.

The VTR crew, who just a few minutes earlier were holding their breath in the fond hope that this hastily assembled contraption of infinite electro-mechanical complexity would perform on cue, were now busily answering questions from excited interrogators who were naturally curious about performance, price and availability.

The prearranged plan had been to record the output of the monochrome camera covering Bill Lodge up to a certain cue point, then the machine was rewound and put into the "play" mode just as Lodge's comments ended. There was no available monitor for the team behind the curtain to check the playback before punching it up on the TV screens in the other part of the room. As a result, they had to operate on the blind faith that everything was working well. That short silence at the beginning of the playback seemed like an eternity to Ginsburg, Dolby, Anderson and Pfost, four of the key members of the Ampex engineering team.

All the hardships, the concentrated efforts, the endless hours of work, and the frequent disappointments were suddenly swept away in the euphoria of success which triggered off an avalanche of videotape recorders that now permeate the entire television world and represent a billion dollar plus industry.

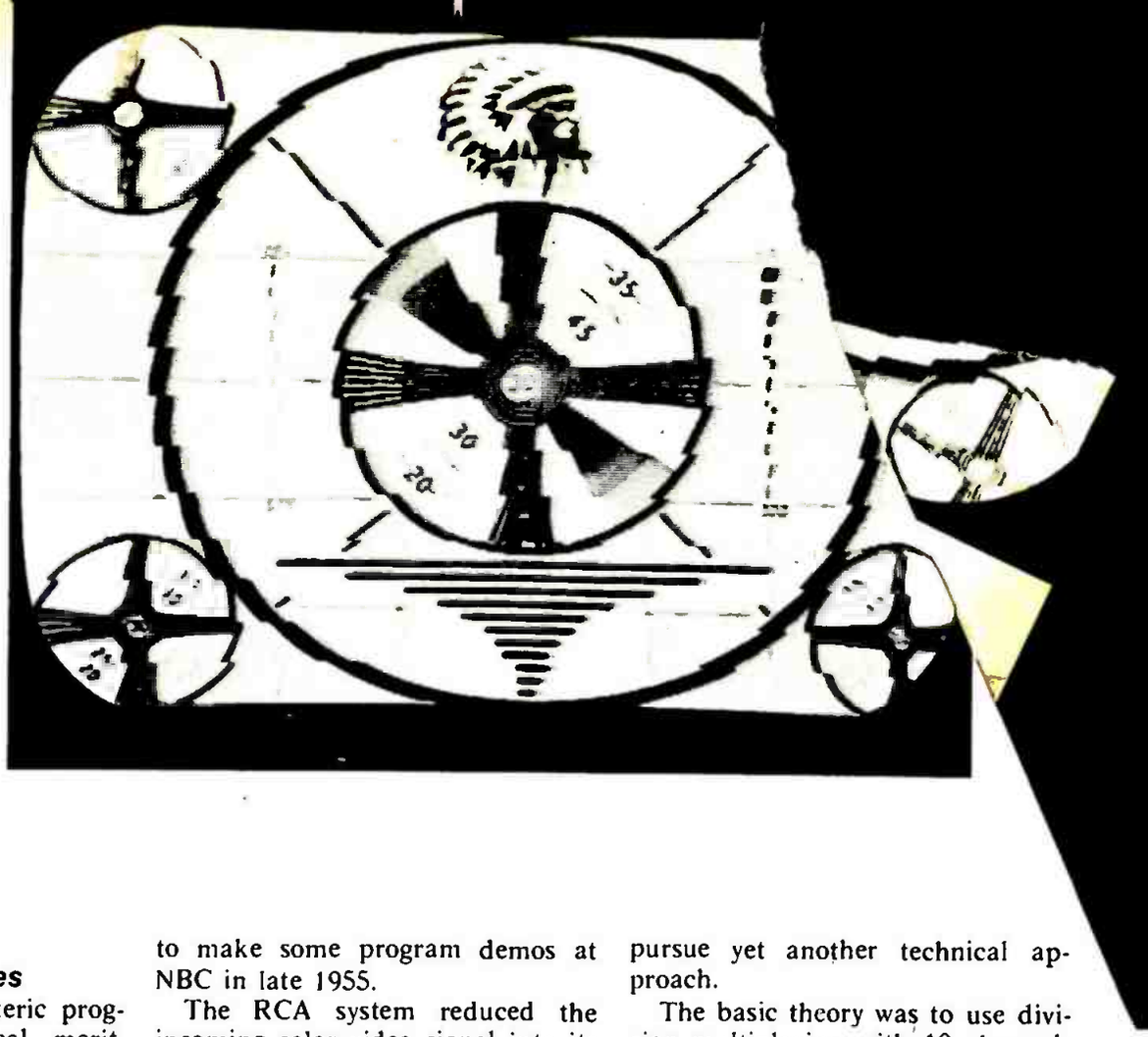
In the four days following, this small California-based company wrote orders for $4,000,000 worth of their magnetic miracle, which represent one of the most expensive recording devices ever made selling at approximately $50,000. Nevertheless, its obvious benefit to TV operations, at least in the program delay category, was sufficiently attractive to warrant the huge investment that the major networks hastily committed in order to equip themselves with VTR's.

A Calculated Risk

Taking a calculated risk, the company's founder, Alexander M. Poniatoff, followed the advice of his two top technical aides, Walter Selsted and Myron Stolaroff, and sponsored a research program to pursue the rotary head approach to video recording. The gamble paid off and videotape recording was launched into an ever expanding sphere of television importance and utility.

The story behind this scientific breakthrough is a fascinating one on a variety of counts. On the technical side, the diversity of opinion in the engineering community as to how to achieve video recording on a magnetic medium was very great. Large organizations, such as RCA, the BBC and others, were sufficiently convinced of the viability of the high speed, longitudinal approach that they were committing considerable sums of money to explore feasibility.

Before delving into the personal histories of the individuals involved and the contributions they made, it might be well to review the prior art in existence up to that revelation in Chicago in 1956.



This is a very early shot illustrating the segmented scan aspects of quad VTR's. The venetian blind effect is one of the many geometrical errors that were to become familiar to maintenance engineers. Skewing, scalloping and quadrature were new words added to the electronic lexicon.

Extending Known Principles

While all of these esoteric prognostications had technical merit, they were too far ahead of existing tape and head technology to warrant much attention from serious experimenters in the field. Instead, the major efforts at that time (late forties, early fifties were directed toward extensions of the known principles of magnetic audio recording by extrapolating those operating parameters into the region of video signals.

Four such known projects were going on, the best publicized one being at the RCA laboratories in New Jersey. Under the direction of Dr. Harold Olson, a man with an excellent reputation in the field of acoustics, a team of researchers built and demonstrated a series of longitudinal, high speed VTR's that made monochrome and color pictures.

RCA Innovations

The first laboratory prototype shown publicly in 1953 used tape one-half inch wide and ran at 30 feet/sec. There were five tracks on the tape and a 7,000 foot reel ran for 4 minutes. Subsequently, the tape speed was lowered to 20 feet/sec. and the playing time raised to 15 minutes. RCA felt confident enough with this advanced machine to make some program demos at NBC in late 1955.

The RCA system reduced the incoming color video signal into its RGB elements, each of which went on a separate track, as did the synchronizing information. The fifth track carried the audio signal which was recorded in FM with a carrier and deviation of 90 kHz and plus/minus 15 kHz respectively. The stationary magnetic heads of one micron gap width could handle frequencies up to 1.5 MHz.

The RCA machine had many innovations that became fairly standard on subsequent VTR's. Tape tension servos, eddy current brakes, luminance/chrominance separation and sync reinsertion, familiar techniques today, were all part of these early recorders.

Clear across the country, in a well equipped lab on Sunset Blvd. in Los Angeles, another VTR project was under way, under the sponsorship of Bing Crosby. The famous singer's early relationship with the Ampex audio recorder and its rapid rise in popularity must have given him the idea that a similar breakthrough in video would be tremendously profitable. With the help of his brother (who was also his business manager), they set up Crosby Enterprises and hired John Mullin to head up a group of engineers who were to pursue yet another technical approach.

The basic theory was to use division multiplexing with 10 channels covering the split up of the desired video frequency range. A bandwidth of 17 kHz per channel produced a cumulative spectrum of 1.7 MHz, adequate for monochrome reproduction. Sync was recorded on an eleventh track to avoid the distortion effects of the band separation filters.

By 1952 Crosby Enterprises were inviting broadcasters in to look at credible results of off air black and white recordings. There were, however, some severe picture impairments that would require much improvement before the recorder could be considered acceptable to broadcasters. After transverse video recording was introduced, the Crosby project was acquired by the 3M Company as their Mincom Division and was put to other recording tasks in the instrumentation field.

The BBC also saw the potential advantage of a vision magnetic recorder, and in 1952 assigned Dr. Peter Axon to lead a long-term effort in this direction. The machine was called VERA (Vision Electronic Recording Apparatus) and was quite different from its contemporaries. Many of the developments achieved in this re-

TS-3000 Digital Framestore Synchronizer

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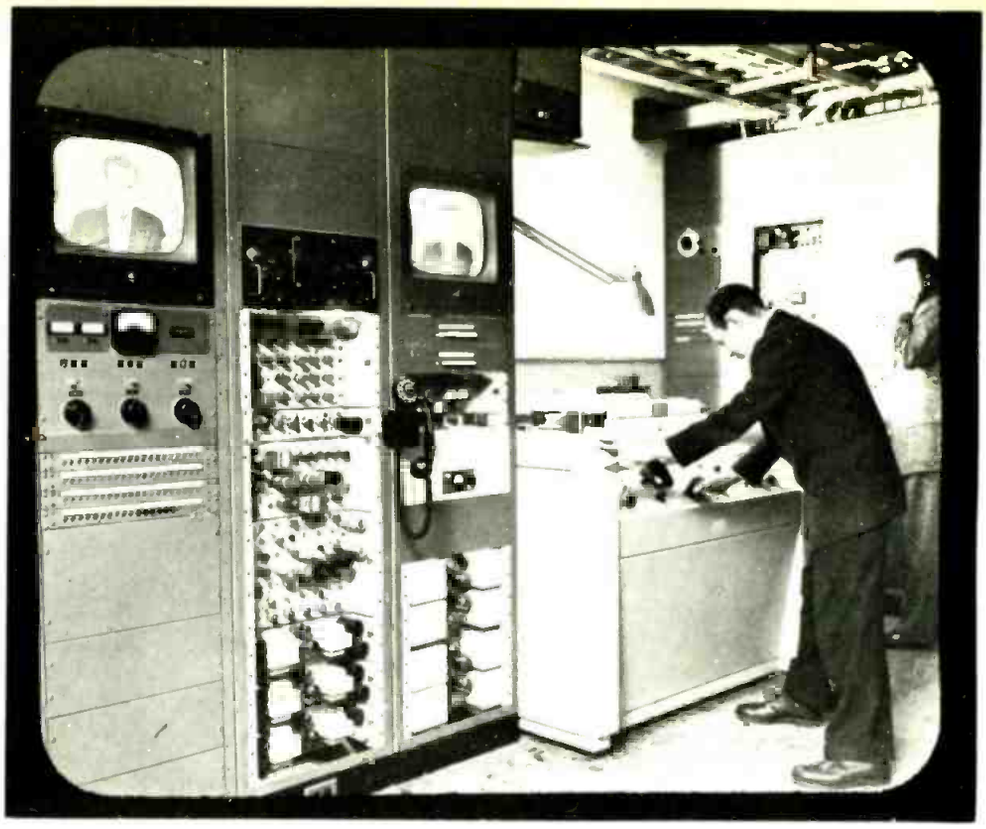

This picture shows the first use of an Ampex VTR for an on-air broadcast of the Douglas Edwards news show.

corder served as departure points for subsequent helical VTR's that were developed later.

The half-inch tape moved at 16 feet/sec. and a 21-inch diameter reel gave 15 minutes of playing time. VERA was capable of a 3 MHz bandwidth, a significant achievement for its era in longitudinal recording. The fundamental approach was to separate the video signal into two bands: the first for all low frequencies up to 100 kHz, the second from 100 kHz to 3 MHz. Low frequencies were recorded by FM techniques while the highs were applied to the tape in AM form. The carrier of 700 kHz was modulated upward for sync pulses and downward for peak whites (the opposite of most present systems) and was deviated by plus/minus 300 kHz.

In playback, the two separate frequency bands were combined to produce an image good enough to put on the air in 1958. VERA had many unique features, among the most notable being heads made of ferrite cores clad with permalloy with a gap width of 0.5 microns and a closed loop tape drive system which held tape speed to 0.04% by locking to an external sync generator and comparing the sync off tape with the reference source.

The BBC terminated the project when it became evident that the transverse approach, introduced by Ampex, would become the standard of the industry. As a matter of fact, Dr. Axon also recognized this potential and shortly after became Ampex's managing director of their Reading operation.

The Japanese Develope DESSAN

While little information was coming out of Japan in those days, it later became evident that several Japanese organizations were also experimenting with videotape recording. The longitudinal effort was called the DESSAN project and was named after an artistic technique which did the broad brush background first (i.e., low frequencies) and filled in the detail later (high frequencies).

In 1953, Toshiba was experimenting with crude helical scan systems, which five years later evolved into both single and dual head prototypes. The presentation of the first Japanese paper by Norikazu Sawazaki of Toshiba on helical recording, at the 1960 SMPTE meeting in Los Angeles, stirred up quite a controversy about the relative merits of basic VTR formats which is still going on. It also caused Ampex to rush to completion an ill-fated two inch helical recorder (the VR8000) which was shipped in heavily sealed, locked boxes to the following NAB convention in Chicago. Flying different aircraft, Ginsburg and Maxey had the only keys to the locks. It was to be demonstrated only if a competitive broadcast recorder, with a helical configuration, was shown. There were none and the black crates were returned to Redwood City unopened.

Lest anyone wonder at this cloak and dagger scenario, it should be explained that fortunes were made or lost on Ampex stock, often as a result of rumor or innuendo. When Dr. William Glen of General Electric announced the first thermoplastic recorder, which he claimed would challenge the videotape position in television, the mere possibility caused a run on the market which took several years of subsequent evidence that the process was impractical for Ampex stock to recover.

Videotape recording had become big business, and like its counterparts in other high technology fields, it needed constant R & D to keep it ahead of the game. □

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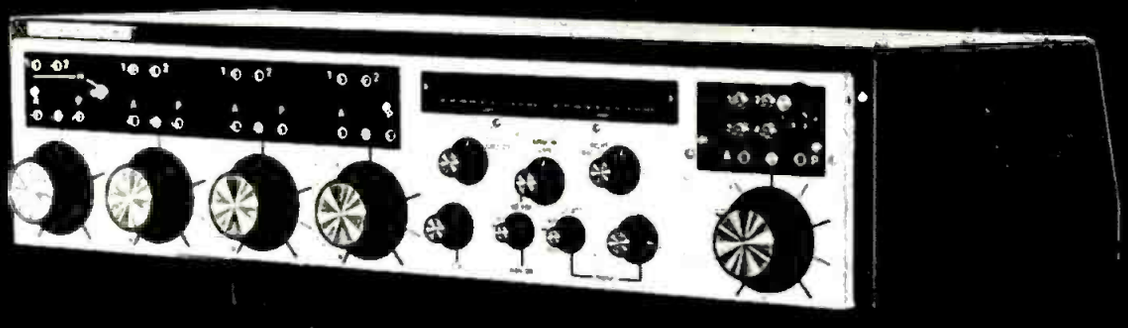

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A painless slide into accuracy

By Joseph Kaspar/Maintenance Supervisor, WOR-TV, New York.

Why is it that no radio station would dare to go on the air without first thoroughly checking its output with VU meters, analyzers, and other assorted test instruments? Yet many smaller TV stations think nothing of starting their daily programming without giving a second thought to the qualitative output of their cameras by checking them against a calibrated source.

One of the most effective test aids used by engineers and technicians to set up their television cameras is the precision test slide. These slides are designed to provide all basic measurement information necessary for consistently meeting performance standards for both color and monochrome TV systems.

Patterns provided by the test slides are used as a reference in adjustment and performance testing by introducing a known standard and interpreting the results obtained. This is similar to the time-honored method for calibrating electronic test instruments by checking them against secondary standards, which themselves are checked periodically against primary standards.

Test slides and patterns have been part of our daily routine from the beginning—and we've been in TV from its inception. They make it possible for WOR-TV to meet its performance standards—without which we could not survive as a major New York station.

The station's three small field cameras are also checked **each** morning before being turned over to the news crews. The test set-up consists of a color monitor, a rack-mounted Tele-Measurements test pattern illuminator, wave form monitor, and associated equipment.

I have found that four slides are sufficient to meet our needs for normal preventive and corrective maintenance. The four patterns we use at WOR-TV are Tele-Measurements' color registration slide, a custom high-resolution slide, a custom linear gray scale slide, and a color fleshtone slide. The slides are stored in the space provided on the illuminator front panel.

The three studio cameras are also checked each morning on an easel under actual studio illumination, using test pattern charts. The critical task of balancing the cameras is accomplished at the control monitor by a member of the video crew. With the four test slides and charts, the normal daily check-out of a camera will take about 10 to 15 minutes.

WOR-TV broadcasts baseball and football games regularly from Shea Stadium, and special techniques have been developed to check out the field camera used at the ball park. Fixed locations, such as the center field scoreboard, provide reference points for aligning cameras, but in general, the procedures are the same as those employed for working with the studio cameras.

Test slides are available in a variety of patterns, which provide reference standards for virtually all color and monochrome equipment needs. At WOR-TV the four most widely used are the patterns for setting resolution, linearity ball, registration, and gray scale. A description of how each test slide is used follows.

Resolution Test Pattern TM-102 is standard reference for measuring resolution, testing for streaking, interlace, shading, scanning linearity and aspect ratio and was originally developed for the Retma chart of 1956. Resolution is the total number of white-to-black transitions that a camera can distinguish across a predetermined area. The higher the ability of the camera to resolve, the greater the apparent focus or sharpness of reproduced image.

Limiting resolution is measured by observing the wedges of the pattern on a high-quality monitor and noting the reading at the point where lines are no longer discernible. The slide provides horizontal and vertical wedges with resolution of 200 to 800 lines. Center and corner resolution are measured separately. Vertical wedges provide the measurement of horizontal resolution, which is a function of pick-up capability, video amplifier band pass, and beam spot density. The horizontal wedges measure vertical resolution—a function primarily limited by the number of scanned lines provided in the system. This is normally 525 lines at a 30-frame per second rate.

Shading and gray scale responses are determined by displaying on a wave form monitor the mid-scale gray background and shading scale or chips around the center resolution wedges. When uniformly illuminated, the pattern will be seen as a flat background on the waveform monitor at line and field rates. The gray scale provides a guide to measure the ability of the camera to differentiate shades from

---

Reference standards mentioned in this article are available as follows:

1. IEEE Standard 202 from I.E.E.E., 345 East 47th Street, New York, N.Y. 10017.
2. EIA Standard for Broadcast Television RS-170 from E.I.A., 2001 Eye Street, N.W., Washington, D.C. 20006.
3. EIA Standard for Closed Circuit Television RS-330 from E.I.A., 2001 Eye Street, N.W., Washington, D.C. 20006.
4. "Specification for Gray-Scale Operational Alignment" from Tele-Measurements, Inc., 145 Main Avenue, Clifton, New Jersey 07014.

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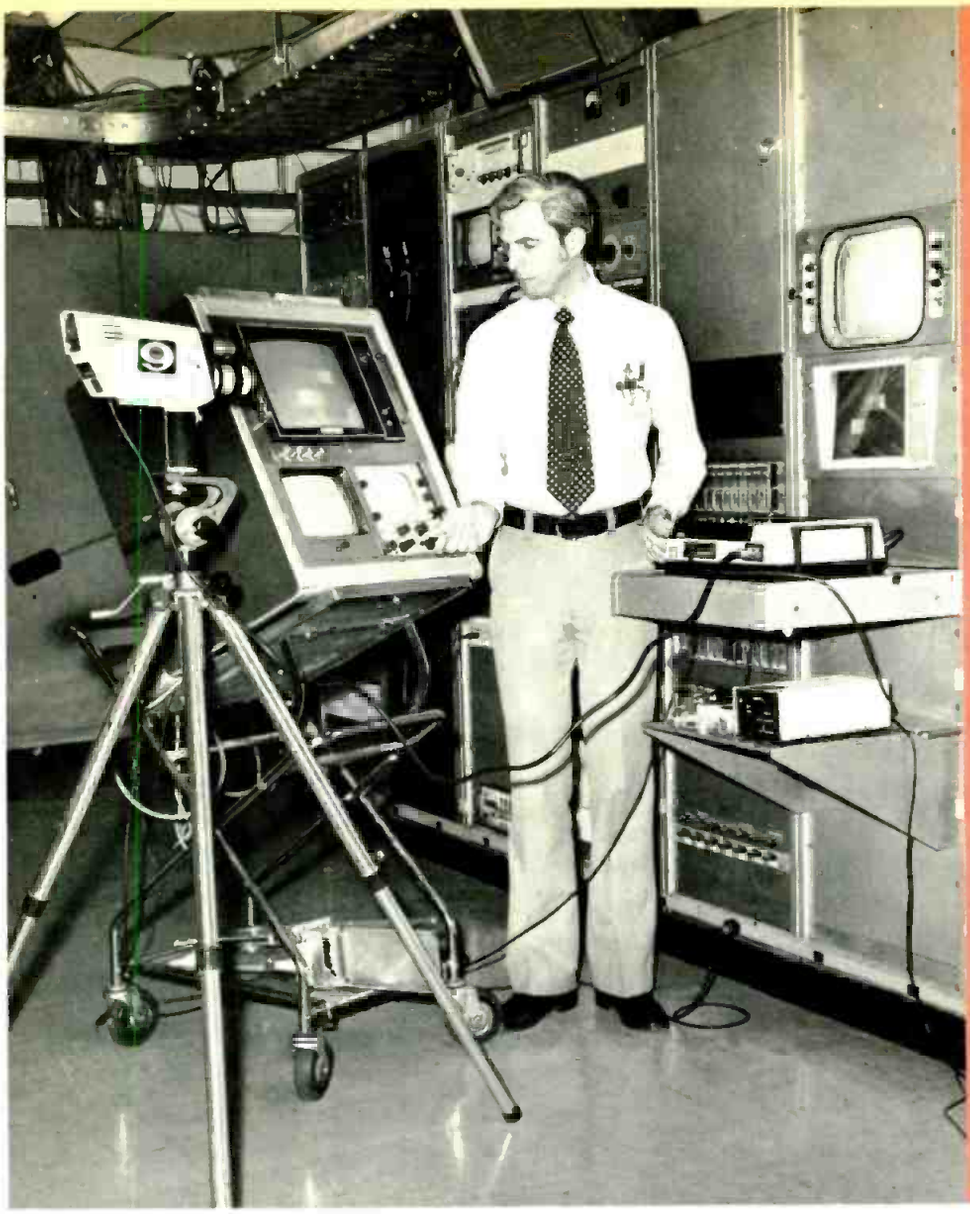


The author checks out one of WOR-TV's cameras with a rack-mounted test pattern system. The Akai camera on the tripod is focused on the test pattern, projecting it onto a color monitor screen for comparison. Monitor also shows black-and-white picture and waveform.

This is a standard resolution test pattern for measuring resolution and checking for streaking, interlace and scanning linearity. The pattern was developed originally for the RETMA chart of 1956.

black or white. Accurate measurement of linear transition should be made, using a response chart approximating that of the pick-up tube characteristics.

Interlace errors are indicated by a displacement of the line bursts outside of the central pattern and by intersecting lines in the central area of the pattern. On modulator-equipped cameras, beam alignment may be adjusted by using the center concentric circles and varying the beam alignment to achieve minimum ringing on heating action. A tail of white or black on the top and bottom bars of the chart is a sign of streaking or smearing. This condition indicates a frequency response problem in the camera system. Linearity may be checked by observing the symmetry of circles on the pattern on a monitor of known performance characteristics.

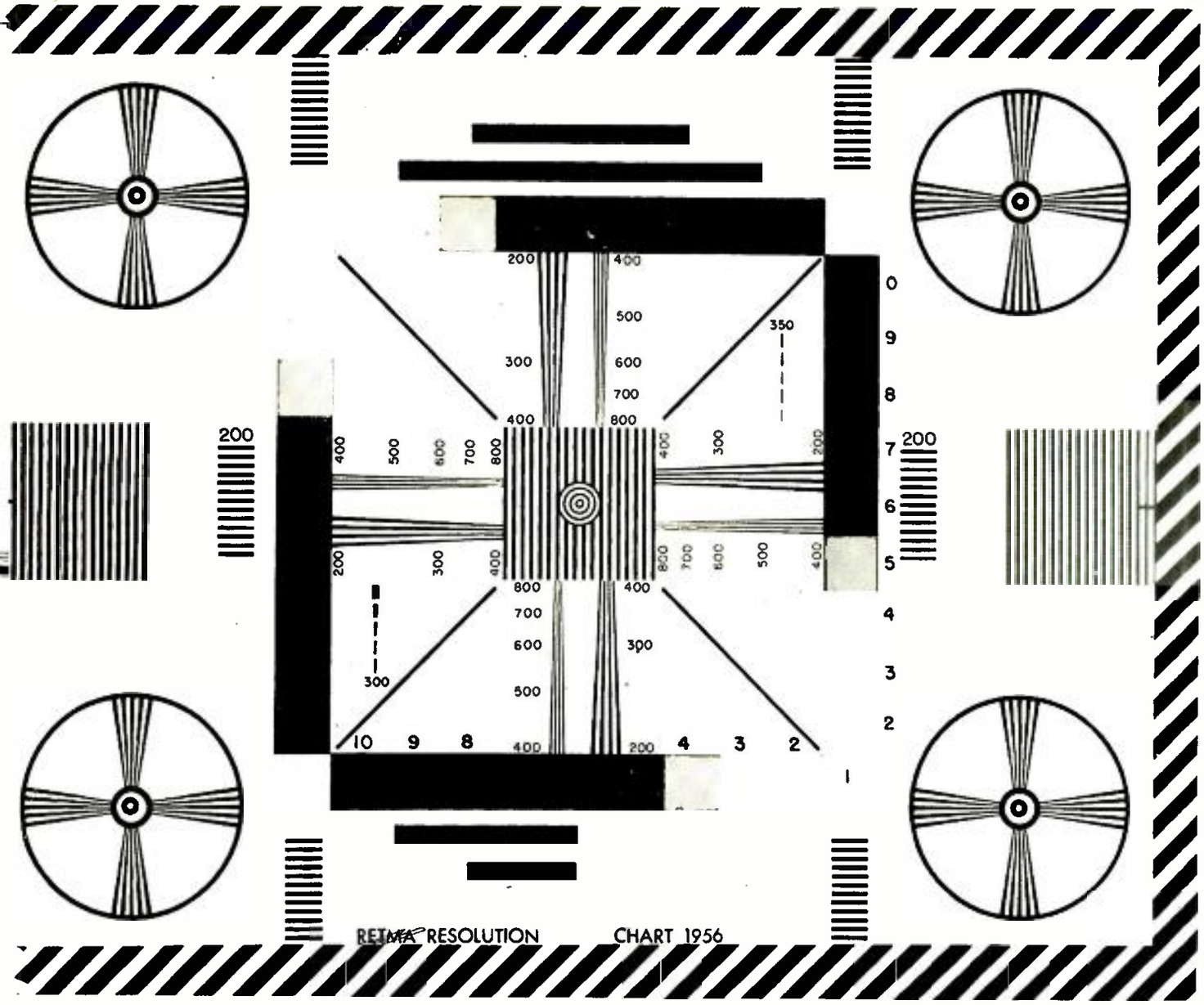
Distortion Testing

The linearity ball pattern is used to accurately measure the geometric distortion of camera sweeps. The distortion may be quantitatively determined, regardless of the characteristics of the monitor used for display, by following this test procedure.

With the camera positioned on the ball pattern, superimpose a cross-hatch generator producing a line pattern of 315 kHz horizontally and 900 kHz vertically over the camera output, and observe on a monitor. If all the lines intersect in the white center area of the "donuts," the linearity is within 1% of the picture area. If the lines intersect anywhere in the black area, the linearity is within 2%. **Should the lines cross outside the circle, the distortion is more than 2%, which is higher than that acceptable according to EIA standards RS-170 and RS-330.**

When adjusting color cameras, set up the green, the luminance, or the recommended reference channel using the aforementioned method. Then match the other colors to it, using the registration pattern.

The registration pattern is used for adjusting the coincidence of images on multi-tube color cameras. Once the reference channel linearity has been properly set-up, the other channel is superimposed over it and adjusted to match it, following the camera manufacturer's recommended alignment procedure. Registration should be observed on a high-quality monochrome monitor with an approximately 17-inch dis-



play. If the camera has provision for inverting the reference channel, it will make critical matching easier to accomplish.

The gray scale pattern checks the light-to-signal transfer characteristics of television camera pick-up and processing. The pattern will reproduce a pair of crossing stairsteps on a waveform monitor, corresponding to the response of predetermined reflectance density of textured chips. By selecting the appropriate scale progression for the pick-up response of the tube, an accurate determination of gamma, gain, black level, and color tracking can be made.

Tele-Measurement test-pattern slides are available in two sizes. The 2" x 2" size is for use with film chains, slide projectors or direct-coupled equipment. The 8" x 10" size is employed with test pattern illuminators. The latter provides for critical camera testing without need for support lighting. The test patterns also are available on 18" x 24" paper charts for use under normal scene lighting.

Accurate Pattern Placement

Positioning accuracy is important when adjusting or performance-testing the TV camera system. The camera optical axis must be perpendicular to the plane of the test pattern. The distance from the camera to the test pattern is a function of the test pattern format and the focal length of the lens.

Unless specified otherwise in the camera manufacturer's instructions, a simple test method is to reduce the monitor sweep so that the raster edges are visible, and then underscan the camera to allow the circular edges of the tube to be viewed on the screen. Set the image size on target using the normal lens or focal length, if equipped with camera zoom.

If necessary, truck the camera to adjust the image size so that the outer corner of test pattern touches the pickup edge. Finally, adjust the camera sweeps to fill the screen horizontally and vertically using standard and alignment procedure.

Precision test slides with an illuminator or diascope should be part of test "tools" in every TV broadcast station, CCTV studio, and college TV training facility. It assures meeting performance standards with easy-to-use test methods that will save much time for both the operator and engineer.

This photo shows the "audiolarm" mounted on the ACR-25 left control panel.

HELP! I've Got A Problem

By Elmer T. Schorle, Jr.

Equipment manufacturers supplying broadcasters most often fill the basic need for that type of gear very well, but sometimes those using the equipment come up with minor additions, or modifications that tend to further improve an item, as it interfaces with their particular plant or system of operation. Were the manufacturer to try to anticipate the variety of alterations that might make his product fit each individual installation, and incorporate each, price and complexity would quickly become burdensome.

Ampex's ACR-25 Videocassette Recorder is one item that has incorporated what would at first seem every feature imaginable to our needs, for now and the future, with it's many automatic functions, random access programming, and ability to interface with complete automation systems. But even it, in day-to-day use, started thoughts towards little changes to help it either become easier to service, or more adaptable to the use we had for it.

I had previously documented the addition of LED indicators aiding diagnosis of mechanical switch performance (March issue of BE) which quickened trouble-shooting. The following is another alteration which tended to improve reliability and adaptability, as the ACR-25 fit into our system of operation, and which others might find useful.

Calling For "HELP"

Often the ACR-25 is called on to perform in a relatively unattended state, once it has been loaded, programmed, and assigned to the "on air line" automation systems. If something malfunctions, it will go into a "Test" mode, with lamps signifying the trouble. Unfortunately, nearby personel may not become aware that trouble exists until too late when nothing appears at an appointed time.

To alert operators to the fact that the ACR-25 needs attention, and has gone to the test mode, we have added an Audio-alarm to each of our machines. The alarm emits a beeping tone when there's trouble. This simple system has saved many air spots when alerted

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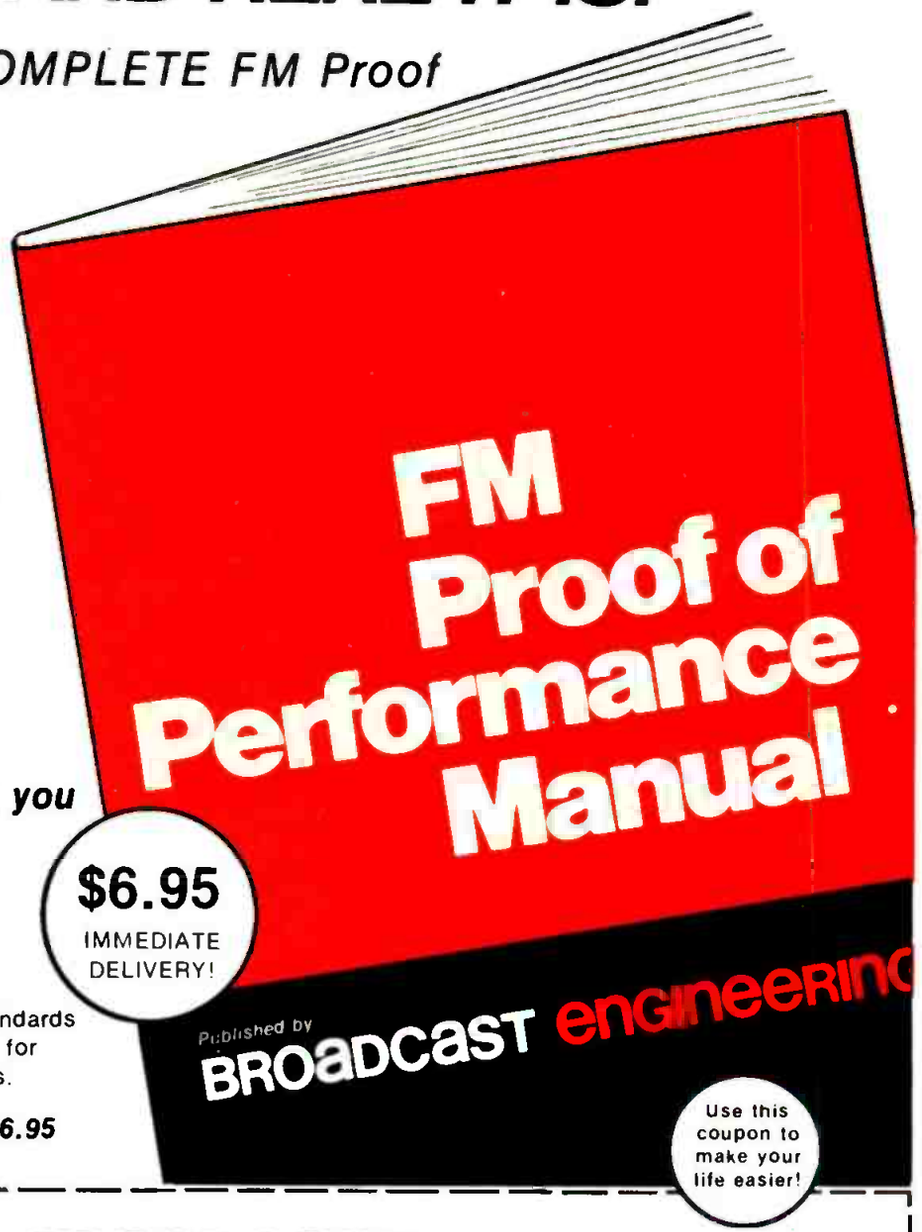

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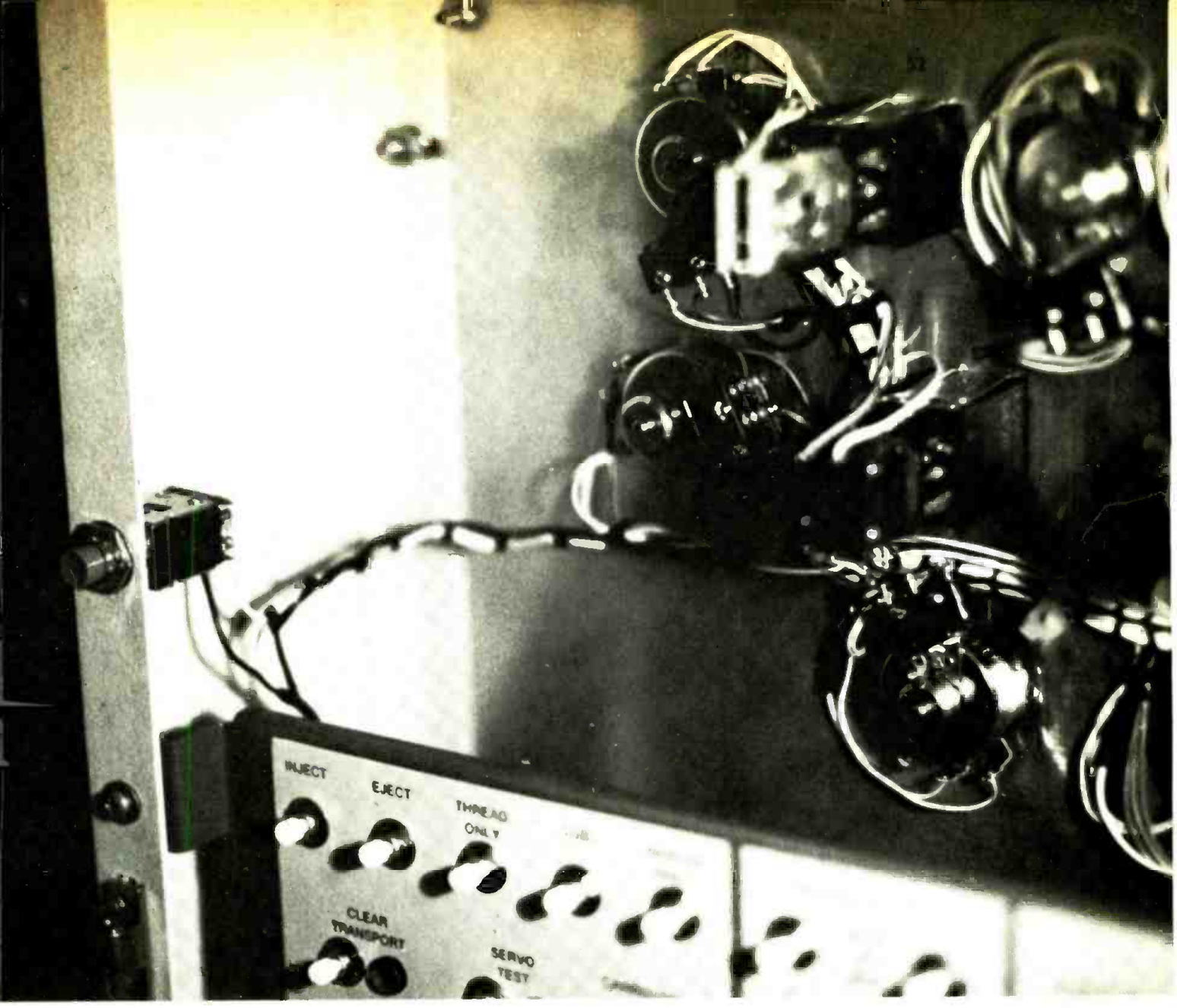

This view shows the alarm muting switch on the door edge near the test panel.

operators quickly rendered aid to correct a mis-thread or other fault. Several 3- and 4-spot breaks have been completed by quick thinking technicians while still in the "Test" mode, after being called by the alarm.

Equipment Requirements

The equipment required is one Audiolarm beeper (#AL-175, Floyd-Bell Assoc. Inc.), one Microswitch #2PB11 (same as a VR2000 brake release switch, Ampex #120-057), and one 6-32 machine screw 1" long, with matching nut.

Our alarm is mounted in a 1-1/8" round hole, centered below the tape speed pushbutton, on the ACR-25 left secondary control panel. (See accompanying photograph). The alarm will operate from a logic level signal, or 28 volts, but since wiring was more easily facilitated with the 28 volt source, the logic level leads were clipped and sealed with shrinkable tubing, and connections made to the screw tie points of the alarm. The alarm is connected parallel to the lamp in the TEST push button on the Test Control Panel, with the positive wire routed through the normally open contacts of the microswitch.

This switch (see photograph) is mounted on the rear edge of the control panel door, and serves to mute the alarm when the operator opens the door to gain access to the Test panel (it being very hard to think with that noise in your ear).

Connections #1 and #2 on the Test lamp/push button are used, with #2 the plus voltage source.

Finally, the machine screw is placed in a tapped and threaded hole in the ACR-25 center panel, positioned to actuate the switch when the control panel door is closed. The secondary panel front dropping cover can be left in place, as the alarm seems to echo louder with it closed than open, and can be heard throughout our operating area.

It is but a simple addition, but it has paid it's way many times by calling immediate attention to problems. □

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For More Details Circle (23) on Reply Card

Small Market Radio Is Alive And Doing Well

By Dennis Ciapura

This is the story of a radio station in a small town with a big heart. In a way, it's the story of several thousand radio stations that dot this great land of our's and really represent American radio.

If you work in a small market, this story may have a familiar ring, for your station probably has a lot in common with WRMS. While the super-stations in the major metro hubs may serve millions of people in one fell swoop, it's the thousands of little stations that bring radio to most of the country.

It's always interesting to take a look at the big stations and see what's newest, biggest, tallest or just about any other kind of "est" that big radio folk delight in, but let's spend a little time in reality and see what makes good old hot dog, apple pie and Chevrolet's radio click.

On a beautiful stretch of the Illinois River about 75 miles south of Peoria, sits the town of Beardstown Illinois, population 6100. Like many Illinois towns, Beardstown shares in the Lincoln heritage and is proud of it's history. The famous Duff Armstrong murder trial in which Lincoln won his first important case as a young lawyer, took place in Beardstown and the courthouse/museum commemorates the event.

The town's name comes from its founder, Thomas Beard, a German immigrant who settled there over one hundred and fifty years ago. It is in this setting that Beardstown Broadcasting, WRMS AM/FM makes its radio home. WRMS AM went on the air in 1959 with 500 daytime watts from a two tower directional antenna system. For many years this facility was the town's only radio station, but in December of 1975 WRMS FM signed on and nighttime radio service was initiated in Beardstown.

The importance of the addition of the FM to the town is best reflected in the fact that the station has covered over 60 basketball games alone during the season just past. Since most of these games are played after local sundown, the AM never had an opportunity to provide the town with what, in this part of the country, is an important community service.

The new FM is a class "A", radiating 3 kw at 300' HAAT, and gets out very well over the flatness of the central Illinois geography. The station's studios are located right on Main Street, not far from the river and across the street from the Beardstown Post Office. Although the main industry in the community is agriculture, several large businesses are operating in the area, like Oscar Mayer and Trinity Steel, which have plants there, as well as many others like Bohn Aluminum, and Alton Box Board. Kent and Critic feeds are made there, and the Illinois Glove Company is busy making guess what.

It seems a happy blend of quiet agriculture and modern industry on mile #88 of the Illinois River, providing between one and two hundred thousand dollars a year in radio revenue. While those figures may look more like monthly income for major market operators, it's quite possible to run a nice community oriented radio business within the framework of that income and that's really the story behind the scenes at WRMS.

A great part of the efficiency that has helped WRMS grow is based on a multi-talented staff. The station operates with a full time staff of four people and a part time complement of four. Just about everybody at the station has an FCC license and does something on the air as well as performing some management or administrative function. It sounds hectic, and often is, but each staff member is afforded an opportunity to grasp "the big picture" and get a real feel for what makes radio work.

Station manager, John Conner, has a First Class FCC ticket and is the sales manager, head of the news department and sports director. These are not merely titles, but functional descriptions of what John actually does. He is on the air with live newscasts several times a day and handles the play-by-play for the sportscasts, and quite well we might add, along with selling ads and sponsorship and supervising the day-to-day operation of the station.

John started with WRMS when

The studio building of WRMS is in the heart of Beardstown. That's Main Street, of course.

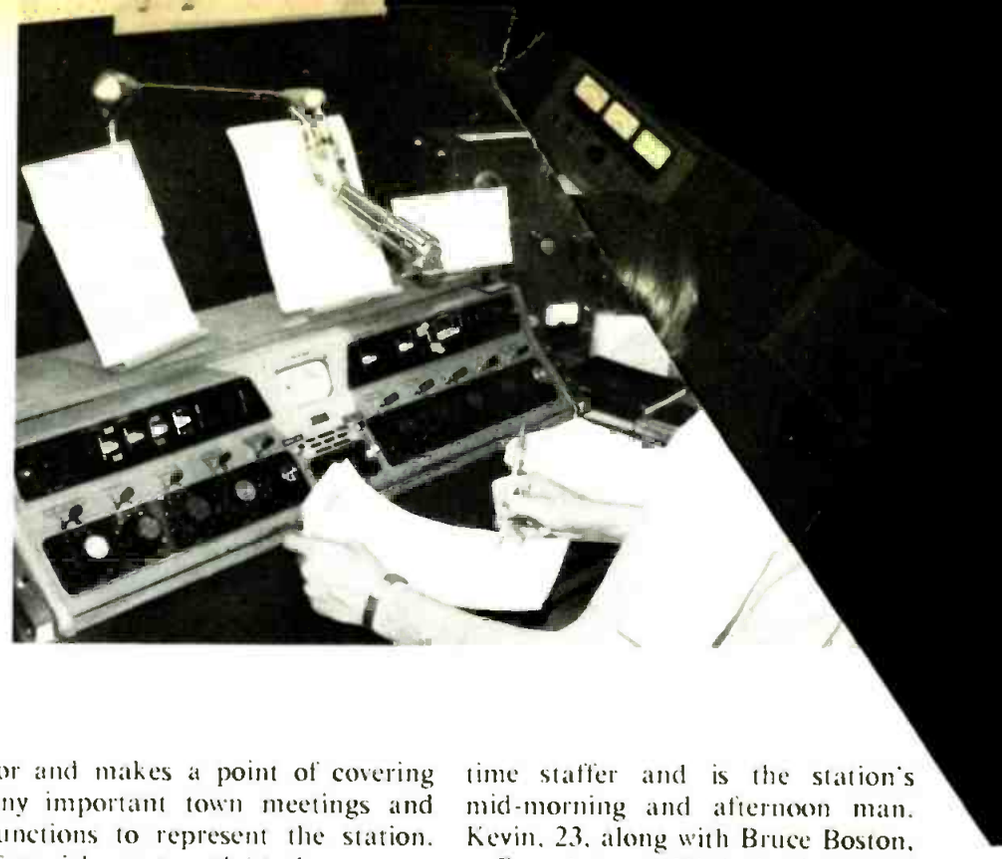
still in high school at age 16, in a pioneer vocational work/study program at Beardstown High. John was the first of the vocational students in the new program and worked at the radio station in the morning while attending classes in the afternoon.

He went on to study for his First Class license and has worked full time at WRMS ever since. John was promoted to station manager in 1972 and has steadily increased the station's business with a program of community involvement and an intelligent sales effort.

The chief engineer is Art Zeeck, a busy fellow with 64 years under his belt and electrons in his blood. Art joined the staff in 1970 and like most of the staff, handles an air shift as well as his engineering duties. Art is one of a couple of guys in town who can be called upon for advice on just about anything electrical or electronic in nature and seems willing to give anybody in town a hand. He is also a volunteer member of the Beardstown rescue squad which has grown into quite an efficient emergency unit.

Art's primary function is to supervise four part time and one full time operator who are working under provisional permits while they study for their permanent FCC tickets. He also maintains the AM and FM transmitters as well as the studio equipment on Main Street The transmitters and antennas for AM and FM are at separate loca-

Inside the WRMS studios there's an atmosphere of station pride and community service. It may be relaxed, but it's serious business for the Conners, shown here working out the details of another day on the air. Susan Pilger, looking on, also handles an air shift.



Kevin Sager brightens up the morning show. In the WRMS production studio, Brenda Carlock punches a cartridge in and begins her day.

tions; the AM about a mile south of town and the FM about 5 miles north near Frederick. There's just enough travel between facilities to keep things busy.

June Conner, John's wife, is the station book-keeper and traffic supervisor as well as salesperson. She is also the public affairs director and makes a point of covering any important town meetings and functions to represent the station. Two girls on a work/study program from Beardstown High, Brenda Carlock and Susan Pilger, help June in the office as well as working on the air.

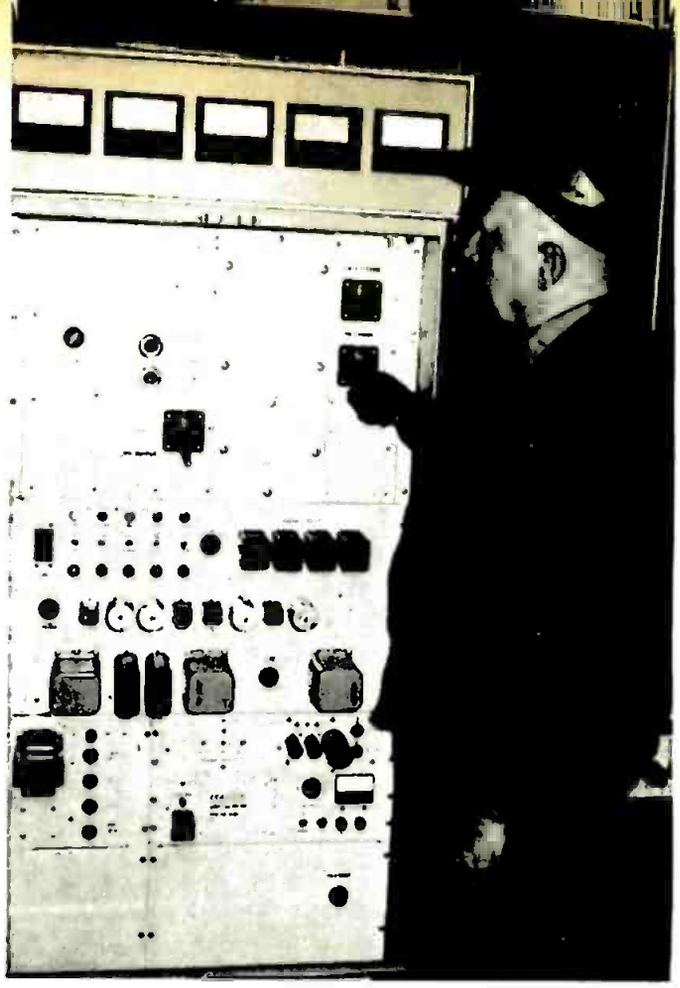
Kevin Sager is the fourth full time staffer and is the station's mid-morning and afternoon man. Kevin, 23, along with Bruce Boston, a Beardstown High junior, and Mike Yost, a senior, form the balance of the air staff.

The AM and FM simulcast an up-tempo rock/MOR format in the daytime, while the FM runs sports

remotes and easy listening music in the evening. This varied format gives the station the diversified programming necessary for a small community and the announcers experience with several types of air work.

The studios are equipped with mono Gates equipment with enough flexibility to allow for expansion. The station is looking forward to installing stereo gear in the near future as a continuation of the station's policy of turning economic expansion back into increased service to the community.

The studio and AM gear is the original station equipment from 1958, but in typical farm country frugality, has been meticulously maintained and kept serviceable. The FM transmitter is a new CCA 3000D, which was installed in December of 1975. The addition of new stereo studio and transmitter equipment will bring the FM side right up to the state of the art. In a



Chief Engineer Art Zeeck tunes up the new FM transmitter, and the day is officially underway. Throughout WRMS, there is a professional, yet personal approach to broadcasting that is the hallmark of any successful station.

town like Beardstown, programming and technical improvements do not go unnoticed for long because of the one-to-one relationship between the station and the community, and that provides a real incentive for the station to make improvements whenever possible.

Large market residents often think of small towns as places where people grow up on farms and then move to the big city leaving the old home town to the dogs. This is largely untrue of course. Mrs. Conner's folks, the Carls, are proud to point out that their grandchildren are the seventh generation brought up in the community. Small towns with good transportation (Beardstown has river, railroad, highway and air) are always attractive places for new industry and just plain nice places to work.

Too many engineers and announcers turn away from small markets because they can't see beyond the bucks to where the values lie. In this Bicentennial year, we think it's particularly appropos to take a second look at the small business aspects of our broadcast industry and the American spirit of individualism that still abounds there. □

How About Your Station

BE went to Beardstown to spend a day with a small market station. Too often we think only of the giants. At WRMS we found a successful station, a proud dedicated staff and a reminder that small market is alive and doing well.

SBE

(Continued from page 22)

program. (*Gary Hartman, Chairman, WSYR, 1030 James Street, Syracuse, New York 13203, (315) 474-3911*).

Chapter 26: Chicago, Illinois

Chicago SBE members met February 18 at WTTW, Channel 11, First, Mr. Don Mesquita, of TFT, gave a review of the new EBS Rules and the equipment needed to comply on April 15. He also showed some of the manufacturing steps necessary to ensure long life and reliability of current electronic equipment.

Mr. Larry Ocker, chief engineer at Chicago's PBS educational station, WTTW, then invited everyone to tour the facility and to enjoy the refreshments. He spoke of the changes that took place when the production people wanted to convert to stereo programming by using a local FM station along with WTTW. The audio fax had to be extensively revamped both in the studios and the VTR room. Audio Design was chosen as the supplier for the new stereo console, and their representative, Bob Bloom, was present to speak from the vendor's point of view, on their design concepts, and how WTTW's problem was solved. Mr. Al Skierkiewicz and John Kennamer, of the WTTW staff, talked about the new concepts from the maintenance and mixers' position, and how the operational aspects were handled. VTR excerpts of some of the shows done with the new setup were shown, utilizing the big-screen projection unit. (*Bob Churchill, Chairman, SBE, 121 W. Wacker Drive, Chicago, Illinois 60601, (312) 729-5215*).

Chapter 32: Tucson, Arizona

Mr. Terry Lloyd from Time and Frequency Technology, Inc., presented an informative program with slides on the subject of EBS. He explained the interconnections and operational procedures of EBS and the manufacturing techniques adopted by TFT for producing EBS equipment, including 100% I.C.

(Continued on page 68)

What To Do Until The Doctor Comes

By Peter Burk/Chief Engineer, WQUA, Moline, Ill.

Whenever the transmitter circuit breaker makes a dull thud, it's usually accompanied by another dull thud...right in the engineer's stomach!

The transmitter has the nearly singular ability to keep us off the air for long periods of time. As a result, we sometimes approach transmitter problems differently than we would other equipment. Maybe it's because the transmitter is bigger than we are, physically. While we can't completely eliminate transmitter troubles, we can substantially reduce them, and as a fringe benefit, reduce the number of bromos consumed by the engineer.

Our patient, the transmitter, needs a number of things to remain healthy. First, a good physical fitness program, including a good diet, plenty of fresh air, and frequent check-ups. Second, someone to diagnose its minor ailments and prescribe remedies before the problems become serious, and third, a well prepared trauma center to take care of emergencies. Since we as engineers don't usually have a fully staffed transmitter medical center to handle these functions, we have to be prepared to handle all of these elements ourselves.

Let's talk briefly about the first requirement—a good physical fitness program. Respiratory ailments can be avoided by making sure that the transmitter gets plenty of fresh air. While a jog around the antenna farm each morning might seem appropriate, a more practical solution is to make sure that air flow through the transmitter is adequate. Make sure that cooling intakes are not restricted and that the exhaust air duct runs straight from the transmitter where possible. **Exhaust fans should be provided with an interlock so that failure will not be allowed to cause potentially disasterous heat buildup in the transmitter.** A manometer installed across the air filter will allow you to monitor the condition of the filter.

HIGH GRID CURRENT:
NO BIAS
EXCESSIVE RF DRIVE
LOW PLATE CURRENT

HIGH PLATE CURRENT:
LOSS OF BIAS OR DRIVE
PLATE CIRCUIT DETUNED
TUBE SOFT
INCREASED SCREEN VOLTAGE

LOW GRID CURRENT:
LOW DRIVE
LOW FILAMENT EMISSION
INCREASED PLATE CURRENT

LOW PLATE CURRENT:
LOW EMISSION
LOW SCREEN VOLTAGE
EXCESSIVE BIAS

Figure 1 Typical symptoms and possible causes.

Check Now.... Avoid Problems Later

Next on our physical fitness program is a healthy diet. Feeding the transmitter nice clean AC will reduce gastro-intestinal problems, both for the transmitter and for the engineer. If you use three-phase power, insist that the power company provide you with closed delta or wye connections...**never** open delta! Each leg on any power feed should be fitted with surge protectors. Lightning is definitely toxic to your transmitter's body.

Your regular transmitter check-ups will help you spot problems before they become serious. Keep accurate records on all of the transmitter's vital signs, including a frequent calculation of efficiency. A good barometer of tube aging is the amount of drive necessary to maintain output. Monitor final filament voltage and maintain slightly below manufacturer's ratings for as long as possible to extend the life of the tube.

Make your proof of performance work for you. The performance of a properly maintained transmitter will **not** deteriorate from one year to the next. Any drop in performance should be investigated, even if the numbers still meet FCC specs.

Monitors are as succeptable to failure as any other piece of electronic equipment. Since we depend on them to know what our transmitter is doing, they should be returned to the factory every couple of years for recalibration.

There are some areas where over-maintaining does more harm than good. Tube rotation, for instance, probably does more to reduce socket life than it does to increase tube life.

Troubleshooting The Transmitter

Our second area of concern, the area we'll devote the most attention to here, is troubleshooting. Before we can put the transmitter "under the knife", we certainly have to know where to make the incision. Fortunately, exploratory surgery is usually not too painful, and the fatality rate is next to nothing. Developing a good, logical approach to solving transmitter problems will save many hours of lost air time.

Approach each problem with the attitude that the transmitter was healthy once before and it'll be healthy again. You can be almost certain that the problem is a faulty component. Don't pick a time when the transmitter is down to design a new version of the circuit that's causing trouble. Get it working the way it was designed to work first. Remember, if it worked once, it'll work again.

The first problem is to define the

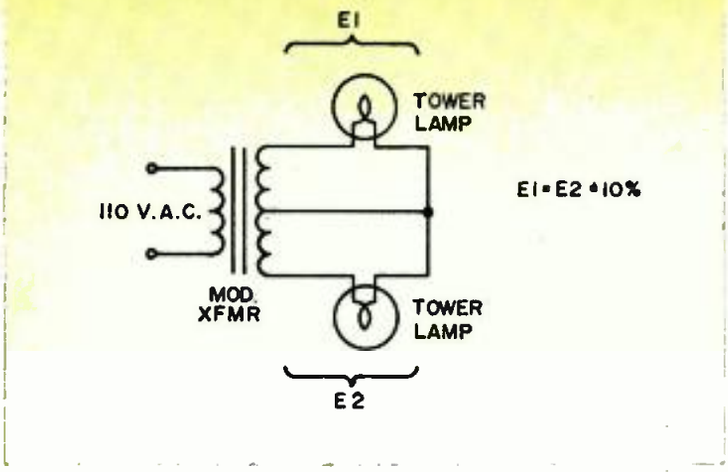


Fig. 2 A method of checking a modulation transformer for shorted turns.

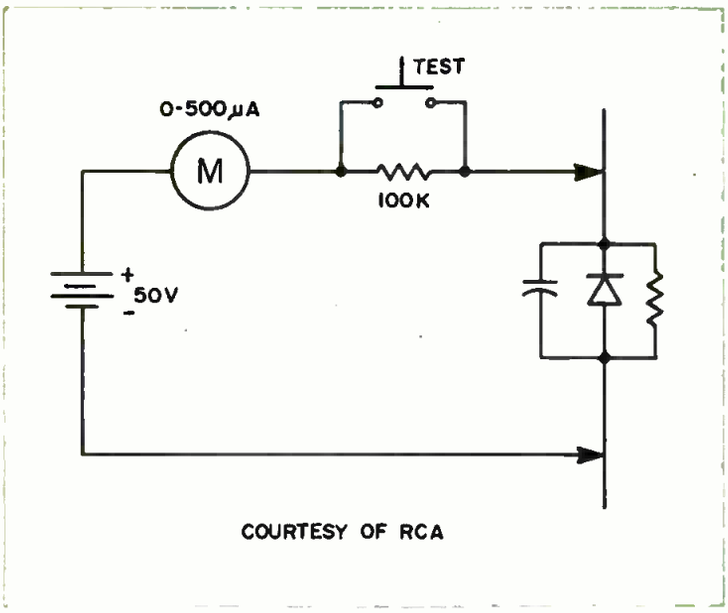


Fig. 3 Circuit for checking high voltage diode stacks.

About the Author

This article is based on a paper presented last month at an engineering session during the NAB annual convention in Chicago. BE wishes to thank the NAB and Peter Burk for their interest in serving the needs of small market radio.

BE extends an invitation to all size stations to submit material that will help further the professionalism of the broadcast industry.

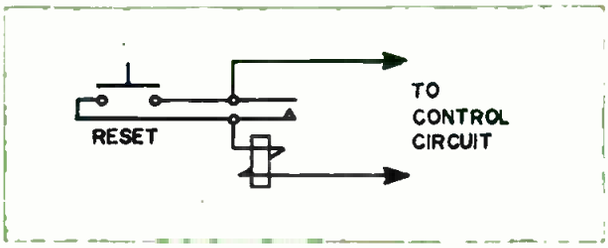


Fig. 4 Latching relay for troubleshooting intermittents.

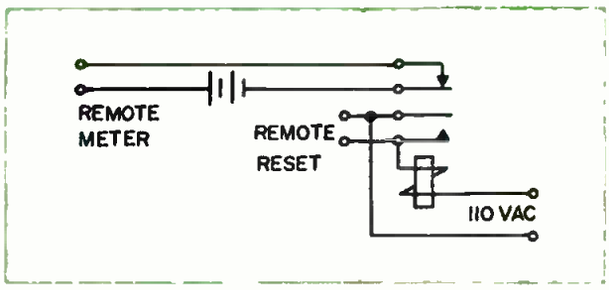


Fig. 5 Power failure detector for remote transmitter sites.

problem. How often have you gone digging into the box not knowing what you were really looking for? The meters on the transmitter were put there for just that purpose. They give you a chance to diagnose the problem before you open the doors on the transmitter. In order to effectively use these tools, you'll have to know what the normal indications are. If you haven't already done so, make a card that you can post right by the transmitter that has all of the parameters listed. Then you can instantly spot anything unusual. In fact, logging the lower stage parameters daily is not a bad idea. This will let you spot trends that indicate an impending disaster.

When you do spot something unusual, apply a little basic theory to determine the probable cause (Fig. 1). For example, a change in grid drive indicates a problem in a lower stage or possibly a bias problem in the indicated stage. If the drive to the buffer or driver falls off slowly over a period of time, better think about tube replacement. Of course, lack of drive doesn't always mean low emission. The interstage tuning should be checked.

If the tuning capacitor doesn't seem to have much effect, you might have a few turns shorted in the coil. One thing to be cautious of here; most tuning capacitors will rotate continuously. If something in the coupling network is off resonance, you may see a fairly normal peak in drive to the next stage at the point where the capacitor is at minimum or maximum capacitance, even though you're far from resonance. To eliminate this false indication, put a mark on the front panel that coincides with the point where the capacitor is fully meshed. If apparent resonance is achieved at this point, or 180 degrees from it, suspect a problem in the coupling network.

An increase in oscillator plate current indicates that possibly the stage is not oscillating. A simple tool for making a quick check here is a transistor radio. You should be able to follow the signal from the oscillator, through the buffer, and into the driver.

If the transmitter won't stay on, it's a little harder to make the meters tell you anything. You still don't have to shoot randomly into the dark, however. Use a logical approach to isolate the stage that's causing the breaker to trip. Usually the first step is to remove the load

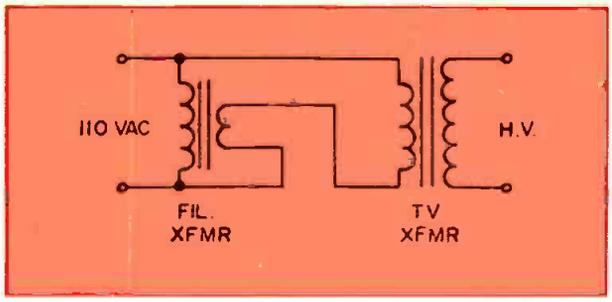


Fig. 6 Buck/boost transformer for adjusting voltage. Polarity of transformer determines increase or decrease.

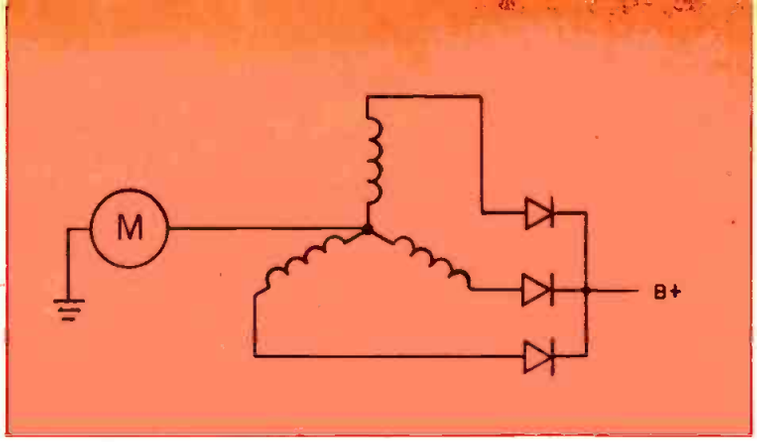


Fig. 7 Emergency 3-phase half-wave rectifier. Voltage will be approximately 50% of normal.

from the supply. Exercise care so you won't create further problems, though. Running a tetrode or pentode with screen voltage and no plate voltage is a good way to destroy the tube. Once you've confirmed that the supply itself is okay, disconnect each segment of the load until the breaker will stay in. Then you can make DC checks to guide you to the trouble.

A Plan Of Attack

Unfortunately, not all component failures are as simple as dead shorts or complete open circuits. As an example, modulation transformers will occasionally develop a short across just a few turns. Here's a simple way to check the transformer using parts that you have on hand at the transmitter. Connect a tower lamp across each side of the primary to provide a load and connect 110 volt AC to the secondary. Measure the voltage across each lamp; they should be within ten percent of each other (Fig. 2).

If you have narrowed your problem down to a power supply, use the same logical approach to find the defective component. Break the supply into three parts: transformer, rectifier, and filter. Divide the faulty area into still smaller units until you find the defective component.

Don't allow yourself to rationalize that a component is probably okay just because it's located in a spot that's hard to reach. This sounds very basic, but for some reason, when we're under pressure, we frequently throw basic logic out the window and end up taking three times as long to find the problem, trying to take shortcuts. I cannot over-emphasize the time tested, sure-fire approach of dividing the circuit into progressively smaller units until the defective component surrenders.

Rectifying The Problem

If your transmitter uses encapsulated diode stacks, remember that you can't check them for opens with an ohmmeter. More often than not, however, a stack will short and that you can readily check with the ohmmeter.

If you want to keep a better watch on the condition of encapsulated rectifiers, measure the voltage drop across a brand new stack.

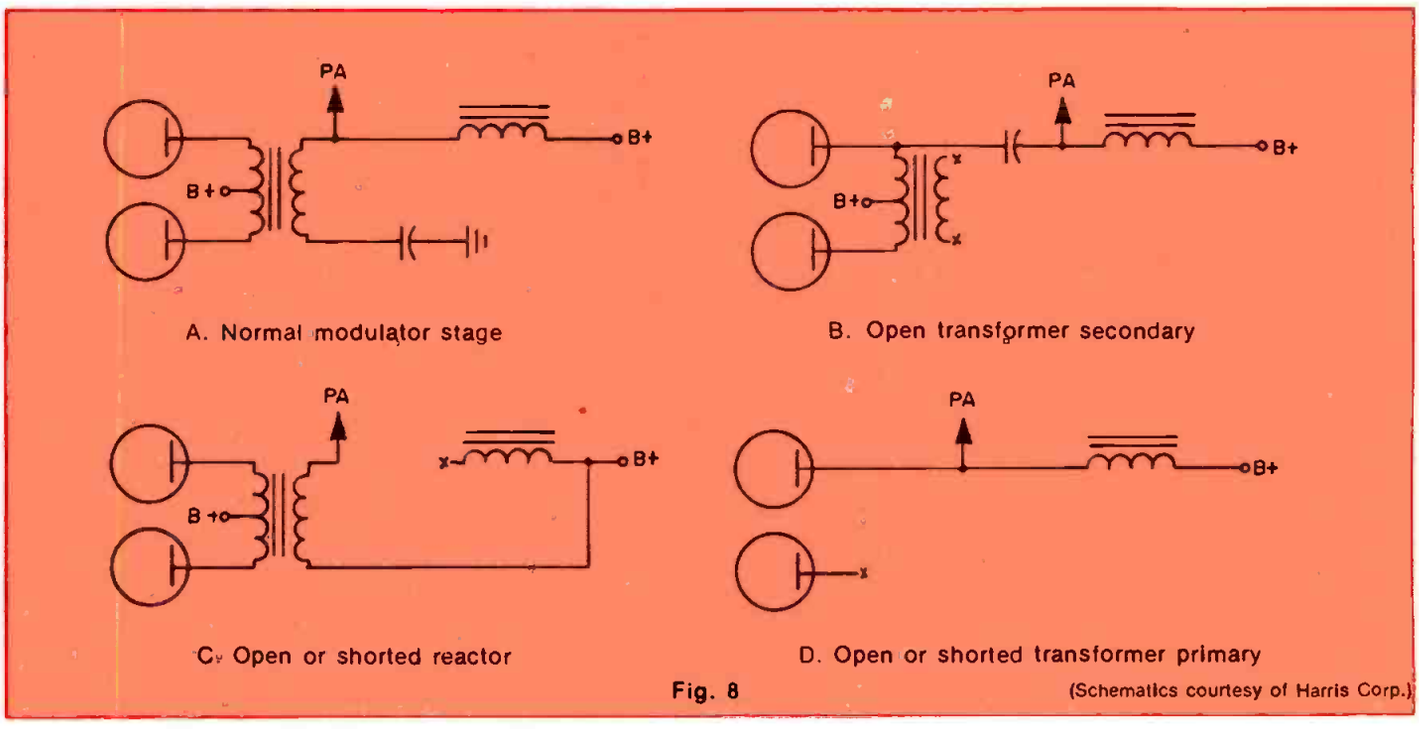


Fig. 8 (Schematics courtesy of Harris Corp.)

Then you can go back any time and read the drop across the ones in the transmitter. If the drop is lower, one or more of the diodes in the stack has shorted.

If your transmitter uses high voltage stacks made up of many individual diodes, it's not a bad idea to check them once in a while. Sometimes a few diodes in the stack will short, leaving the stack operational, but subject to premature failure. Figure 3 shows a simple circuit that can be used to check each diode without taking the stack apart. If the cell under test is shorted (or connected with reverse polarity) the meter will read full scale. When the switch is pressed, a good cell will read about 100 microamps. Anything above this indicates a degraded cell. With the connections reversed, anything under full scale indicates poor forward conduction or an open cell. If you don't have a spare stack on hand, a small investment in a handful of diodes would be a good idea. Don't forget to keep some appropriate value bypass caps and equalizing resistors on hand, too. If you find yourself rebuilding a stack in the middle of the night, having fresh components with nice, long leads will speed the task along considerably.

One solution for mercury vapor rectifier problems is to replace them with solid state units. In addition to improved life and freedom from arcbacks, you have eliminated the rectifier filament transformer—just another source of "ooze" in an older transmitter. If you're still using mercury vapors, have a spare set all cooked in and stored vertically, ready to install. That initial 30 minute ionization period seems like hours if the transmitter is off the air.

For some reason, most engineers treat meters as if they were sacred cows. They are just another component in a transmitter and subject to the same failures as any other component. Let's look at several ways we can confirm that those wagging needles are telling the truth.

Most transmitters have sample voltages brought out for use with remote control systems. The sample is generally taken from the same point as the local meter, but scaled down to something under five volts. If you measure the voltage at this point with a good VOM, you can compute the ratio between the VOM and the local transmitter meter. If you later suspect the plate voltmeter, just check the remote sample point with the same VOM and you'll know for sure.

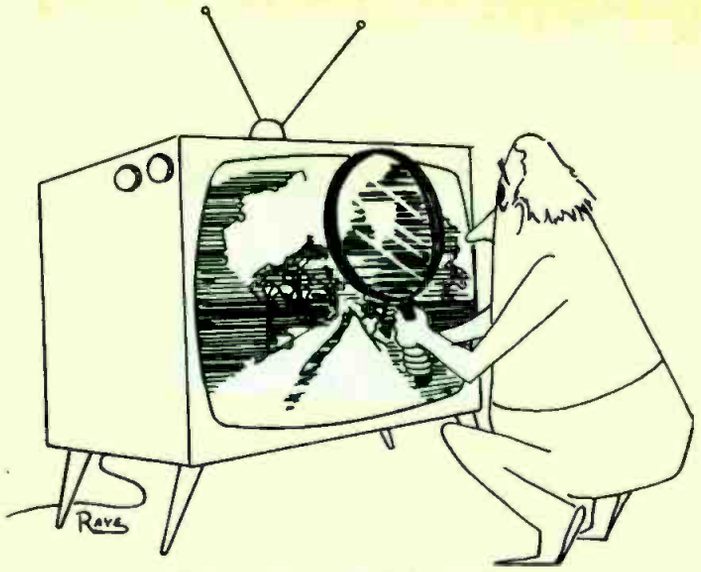
You can check an RF ammeter by putting another meter in series with it. If the readings aren't within four percent of each other, at least one of them is in error.

Next Month

Next month we'll continue this discussion with deeper search into the circuitry and how to put a hex on Murphy's Law.

Is U.S. Television Technically Inferior?

By Ron Whittaker



What do you mean 525 lines?
I can only count 480!

It is not uncommon for someone to return to the U.S. from a trip abroad and remark, "Their television pictures seemed sharper and clearer than ours, and their sound seemed better than what I'm used to over here."

The question of whether the U.S. is "stuck" with an inferior technical system of television by today's world standards is a legitimate one, since it is well known that historically we got into the television business rather early. If fact, it was in 1941 that the National Television System Committee (NTSC) recommended the standards for U.S. television to the FCC. This was only two years after U.S. television was publically "unveiled" at the World's Fair. Since that time, there have been some very significant breakthroughs in TV technology—breakthroughs that have subsequently been available for incorporation in TV systems adopted by other countries.

From the standpoint of the *number* of countries in the world using the various TV systems, the U.S.-NTSC system could actually be considered a "minority system." The majority of countries are on some type of 625 line system.

World Television Systems

Although there are actually 14 separate technical approaches to broadcast television used in the world, just a few systems serve the vast majority of countries. The basic differences in the systems lie in the number of lines, the channel width (RF bandwidth), the type of modulation used for audio and video and the approach to handling color information.

The number of lines ranges from 405 used in the United Kingdom for their black and white broadcasts, to 819 lines used by one TV service in France. The channel width ranges from 5 to 14 MHz. Audio is FM in most systems. (AM television audio is generally associated with national systems that are being phased out, but France is a major exception here.) Both positive and negative modulation of video are used, but like the U.S., most national systems use negative modulation. Three approaches to handling color information are used —the U.S.-NTSC, the German Phase Alternate Line (PAL) system and the French Séquential Couleur À Mémoire (SECAM) system.

The U.S. system of 525 lines, 30 frames per second (60 fields) is shared by Canada, Mexico, Latin America, Japan, Peru, Panama, the Phillipines, Puerto Rico and South America.

Most of the rest of the world is on the 625 line, 25 frame system. Whereas the U.S. system uses a combined audio and video bandwidth of 6 MHz, the 625 system uses both a 7 and 8 MHz bandwidth, depending upon the country. France's 819 line system, with a bandwidth of 14 MHz, is capable of very high resolution, but its incompatibility with the rest of Europe has presented such a problem that it is being replaced by the 625 line European standard. (Both of France's systems use amplitude modulated sound.)

The Communist countries almost all use the 625 line system with a 8 MHz bandwidth. The 405 line system used in the United Kingdom for black and white broadcasting, is phasing itself out with the growth of color there, which is broadcast by the 625 line, 8 MHz system. Although it might be nice to assume that a country's TV standards were based purely on technical needs and quality considerations, in actual fact, political considerations have been a major factor with many countries.

Two basic systems have emerged as major world systems—the 525 line, 60 field system of NTSC, and the 625 line, 50 field system using one of the PAL approaches to color. These are the two systems most often compared.

525 Lines Vs. 625 Lines

Against one of the newer 625 line systems, it would appear that the United States is coming off "second best" in TV picture quality because of the fewer scanning lines and the narrower bandwidth (6 MHz vs. 8 MHz). Studies, in fact, indicate that, under many conditions, the 625 line approach, in general, produces pictures with more apparent detail. However, comparisons are extremely difficult because of a profusion of complicating factors all along the line. Studies on TV picture sharpness comparisons go back over ten years, and the proce-

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dures which have been developed for controlling variables and trying to objectively evaluate an essentially subjective thing like picture sharpness have become incredibly complex. (Are you most affected by vertical resolution or horizontal resolution? What is the relative amount of image blur of the 25 frame and the 30 frame systems when it comes to a moving subject? What about color sharpness versus luminance sharpness? What about the system's ability to handle contrast and a thing called "modulation transfer function?" What viewing distance are you considering?... etc., etc.)

"Copping out" of a discussion of all these (important) issues and dropping down somewhere near the "bottom line," it can be stated that repeated subjective comparisons of the two systems rather consistently point to a slight superiority in the 625 line system for reproducing image details.

It must be kept in mind at the same time, however, that a "price" is paid for this slight but significant increase in picture resolution. The extra one or two megahertz of RF bandwidth means that fewer stations could be accommodated in an existing television spectrum space. For countries with a limited number of TV stations on the air, this is not a problem, but with countries such as the U.S. or Japan this compromise of bandwidth for stations would be significant. Also, as the number of lines goes up, the complexity of the associated electronics increases.

All things being equal, a 625 line TV system will be able to resolve (horizontal resolution) about 100 more lines than a 525 line system. As will be explained later, a great many things get in the way of consistently experiencing this greater resolution capability, however—at least from the standpoint of a home viewer.

But, for a moment, continuing the 525-625 comparison, it might be helpful to refer to a study in Raymond Wilmotte's analysis in "Technological Boundaries of Television," distributed by the National Technical Information Service of the U.S. Department of Commerce. In a simulated comparison of a 525 and 625 line system at a distance of about three feet from a 20 inch wide TV monitor, subjects rated a 525 line picture as "poor" in sharpness and a 625 line picture as "fair." As viewing distance increased, however, the difference in relative perceived sharpness was reduced. At a distance of about 6 feet both systems were judged as "good," although the 625 line system was still recognized as being superior. At 12 feet the difference between the two systems was perceived as being even less significant, but subjects still gave the image sharpness of the 625 line system a slightly better rating.

Practical Quality Comparisons

Comparisons which take place under conditions that are more "laboratory" than "home" leave out some very basic intervening variables. Once you trace what happens to TV picture quality on a set owned by "Mr. Average American," some really depressing things become apparent. And here is where the quality of the U.S.

(Continued on page 57)

U.S. Color

(Continued from page 52)

system until rather recently really took a back seat.

The weakest link in the whole TV quality chain is the home receiver. For starters, many consumer sets do not even take advantage of the full video bandwidth resolution broadcast by U.S. television stations. The reason mostly comes down to cost-cutting considerations.

The same, of course, can be said of the quality of audio associated with a typical home receiver. Although the FM audio signal may meet FCC standards and be "flat" from 50 to 15,000 Hz when it is broadcast, by the time it is filtered through a low-grade TV audio section and a four-inch speaker, the resulting quality leaves a great deal to be desired.

Unfortunately, it seems that most TV set owners are only concerned about TV audio when it is not there! And, understandably, manufacturers are not willing to put themselves at a price disadvantage by upgrading audio sections if the typical buyer cannot recognize or appreciate the difference, or—and here is another aspect of the problem—if a great percent of the programming contains a rather restricted audio quality to start with (due to old optical film tracks, poor network relay quality, etc.)

Since audio fidelity is generally not stressed in U.S. television productions, hooking your hi-fi system up to an early (relatively pure) section of your set's audio system may provide you with audio information that you may subsequently decide is better off being "lost" in a poor audio system. (Why is it that combination hi-fi and TV systems typically don't route the TV sound through the full-range amplifier and speakers?)

NTSC Vs. PAL

As originally proposed, the PAL system of color was seen as an improvement in the NTSC system, and not as a completely new approach. The basic idea is to correct for hue error in TV pictures (resulting from phase distortion) by a phase error compensation method of switching alternate scanning lines through a shift of 180 degrees. In effect, a NTSC color signal is

(Continued on page 59)

PEOPLE IN THE NEWS

The National Association of Broadcasters has announced the election of 18 prominent broadcasters from throughout the nation as members of its Board of Directors.

Elected to the Radio Board were:

District 2—(New Jersey and New York) William O'Shaughnessy, president, WVOX AM-FM, New Rochelle, N.Y.

District 4—(North Carolina, South Carolina and Virginia) Carl V. Venters, Jr., president and general manager, WPTF/WQDR, Raleigh, N.C.

District 6—(Arkansas, Louisiana, Mississippi and Tennessee). Len Hensel, vice president and general manager, WSM AM-FM, Nashville, Tenn.

District 8—(Indiana and Michigan). John R. Anderson, president and general manager, WCCW AM-FM, Traverse City, Mich.

District 10—(Iowa, Missouri and Nebraska). R. M. McKune, president and general manager, KTTR/KZNN, Rolla, Mo.

District 12—(Kansas and Oklahoma). Pat Murphy, vice president and general manager, KCRC AM-FM, Enid, Okla.

District 14—(Colorado, Idaho, Montana, New Mexico, Utah and Wyoming). Wayne Cornils, president and general manager, KFXD AM-FM, Nampa, Ida.

District 16—(Arizona and Southern California). Jack Willis, vice president and general manager, KHEP AM-FM, Phoenix, Ariz.

Class "A" (markets of 500,000 population or more). David G. Scribner, president, Doubleday Broadcasting, KHOW AM-FM, Denver, Colo.

Class "B" (markets with populations between 100,000 and 500,000). Herbert W. Hobler, president, WHWH/WPST, Princeton-Trenton, N.J.

Class "C" (markets with populations between 15,000 and 100,000). Dick Painter, general manager, KYSM AM-FM, Mankato, Minn.

Class "D" (markets with populations below 15,000). Jack S. Younts, president and general manager, WEEB, Southern Pines, N.C.

(Thirteen Radio Board directors—nine from odd-numbered districts and four at-large—have another year to serve. The remaining five directors are appointed to represent national radio networks.)

Results of the Radio Board election were certified by a three-member committee made up of Gordon Peil, WKYS(FM), Washington, D.C., chairman, and Bruce Houston, WEAM, Falls Church, Va., and Charles Macatee, WMAL, Washington.

Business-Industry

Since last month's column, we've received word of more changes within the broadcasting community. ...For instance, at Television Research International,

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U.S. Color

(Continued from page 57)

transmitted in one line and a "mirror image" of the signal in the next line. The eye then averages the two lines and perceives the separate lines as combined (averaged) color information. Unwanted phase shifts caused by VTR problems, multipath reception or whatever then affect the two opposite signals so that the errors cancel each other. The net effect is a picture with extreme chroma stability. The process requires high speed electronic switching circuitry, which increases the cost of receivers about four percent.

This super-simplified explanation does not really do justice to the basic PAL process. And there are actually three forms of PAL currently in use. Some of the newer versions have a color signal that is totally stable and durable under extremely adverse reproduction and transmission conditions.

But even the Germans who developed PAL have a great respect for the NTSC idea. Walter Brueh of Telefunken was quoted as saying that the NTSC solution to televising color "certainly belongs to the outstanding physical and technical masterpieces of the century."

However, until recent developments resulted in the addition of added circuits to U.S. receivers to help stabilize color balance, the NTSC color system was rather fragile and unstable. PAL and SECAM were both considered to represent superior broadcast techni-

(Continued on page 63)

People

(Continued from page 58)

Inc., **Harold C. Blakeslee** assumes his company's presidency....A background in radio and broadcasting has resulted in **Edward M. Corse** being appointed staff engineer at LPB Inc.

The newly formed Beaucraft Division of UMC Electronics has chosen **Charles E. Collett** as its manager of sales and marketing while **Cindy Guzzo** fills a similar position of marketing manager at Pacific Recorders and Engineering Corporation.

Bill Kneedler has recently received word of his appointment to general manager of Unimedia.... Several states away in Omaha, Nebraska, McMartin Industries has given the responsibility of central sales manager to **Tom S. Butler.**

An election at Conrac Corporation resulted in **Frederick S. Wonham** being chosen their board director....Videodetics of Anaheim, California, announces that **Ron Coleman** has joined the company as national marketing manager with special emphasis on Learning Resources Products....And in this same area, the new director of marketing at CCA Electronics is **A. W. (Bill) Trueman.**

The Federal Communications Commission has seen some changes in personnel recently as **Arthur Bernstone,** chief of the Rules and Standards Division, retired and **Alan R. McKie** assumed the job of deputy executive director.

NEW PRODUCTS

High Performance TBC

Consolidated Video Systems, Inc. has introduced the CVS 520 high performance digital time base corrector. The CVS 520 is designed to handle segmented (Quads, IVC 9000, etc.) and non-segmented (Helical, U-Matic, etc.) video signals principally for broadcast and other high level studio systems. The CVS 520 utilizes a 9 bit, 4 times subcarrier, PCM digital sampling technique.

Specifications include: Signal-to-noise greater than 60 dB; Differential phase less than 2°; Differential gain less than 2%.

The CVS 520 standard features include: Line by line velocity correction in all color modes; Automatic direct/heterodyne color switching; Video level meter; Built-in drop-out compensator; Built-in adjustable proc amp; Front panel primary and secondary controls; and the active video portion of the last 8 lines of vertical blanking may be individually selected to pass vit, vir, and other test signals.

For More Details Circle (82) on Reply Card

Framestore Synchronizer

A new Digital Framestore Synchronizer (DFS-3000) has just been announced by **MCI** (Micro Consultants, Inc.), national distributor of the product. Manufactured by Quantel, Ltd. of Caterham, England, the DFS-3000 is capable of storing 2 complete fields of video. The unit is capable of synchronizing any video source including VTR inputs. The source may be local or remote, fed by line or satellite.

For More Details Circle (65) on Reply Card

Digital Clocks/Timers

Pacific Recorders and Engineering announces the new Digitimer II family of clocks. Two standard master clocks, the DT-2M (reads in minutes and seconds) and the DT-2T (reads in minutes, seconds and tenths) have four pushbuttons on the front panel that control

(*Continued on page 62*)

timing functions.

Both master clocks have complete remote control capability and up to ten master clocks can be paralled. Each clock can drive as many as ten DT-2S slave units (DT-2S reads minutes and seconds) placed up to fifty feet away.

The unique member of the Digitimer family is the DT-2C. A digital timer with a clock face. The DT-2C reads in minutes and seconds, digitally, in the center of a simulated clock face. Replacing the sweep hand on the clock face are 60 illuminated LED's. As the seconds tick off, so do the LED's allowing the viewer to see how many seconds have elapsed. This illuminated sweep second hand provides a unique, yet functional way to give talent a visual idea of time. The DT-2C can be used as a single timer, or can be used as a slave from either the DT-2T or DT-2M.

For More Details Circle (66) on Reply Card

Edit Decision Lister

Time Tech Corp. announces the low-cost answer to the problem of

U.S. Color

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ques, even though they resulted in some loss of vertical resolution. The latest NTSC receiver technology now makes possible color stability which definitely rivals the best of the PAL systems.

Quality and the U.S. Consumer

The television system in the United States is highly responsive to the preferences of consumers, probably more so than in any other country. As a greater awareness develops for uncompromising audio and video quality in television, the industry will undoubtedly respond. But a television viewer who is not motivated (or does not know enough) to adjust the contrast or color balance on his set to bring into the general ballpark of NTSC intentions, is not going to lead a campaign to upgrade technical quality. (How many homes of non-broadcast friends have you visited where you were just itching to get up and fix a badly adjusted TV set?) For many people, television is still some sort of an enigma.

The writer has an aunt (with a master's degree) who has lived in a particular area for several years and only recently found out the "U" on her VHF dial can be used to get three UHF stations in her area. She had just always assumed that these stations weren't available for some reason. She even had been watching several VHF stations in monochrome because she did not understand the mysteries of the fine tuning knob. For such people the new automatic frequency and chroma circuitry will make all the difference in the world (once they buy new sets).

U.S. broadcasting, being in a competitive commercial environ-

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Products

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having to hand-write all of the pertinent information for each edit decision during a pre-edit preview session. The editor can concentrate on the material and not be distracted by manually writing SMPTE time, type of edit (Audio/Video), Reel Number of the source material and whether the edit point is a Start or Stop.

The Model 9510 Edit Decision Lister records all of this information automatically when an edit point is selected "on the fly" and neatly formats the list on a standard ASR-33 teletype. A tape recorder remote keyboard on the control panel of the unit allows control of the previewed material

For More Details Circle (69) on Reply Card

Limiter, Bridging Amplifiers

ITI Electronics, Inc. is now making available to broadcasters, two amplifiers which are useful in the control and monitoring of audio signals. These amplifiers have gained a good reputation for reliability and performance in the telephone industry, and are part of a complete line of amplifiers used to fill a variety of functions in telephony.

The ITI-TLC 222 Limiter Amplifier provides control of level. It employs an LED/photo-diode feedback which assures fast attack and low distortion in its leveling action. The TLC 222's integrated circuit gain stage has been chosen for its

(Continued on page 65)

Zoom in!

(This column will feature ASTVC personalities who, from time to time, will tell their stories of interesting events or incidents taking place while telecasting or taping in the studio or on location. This story is sent to us by Al Camoin, NBC cameraman and a member of the board of ASTVC.)

Air date: March 9, 1976...

"A couple of very interesting events occured on my recent trip to California to tape the GO show. This special was based on stunt men and how their stunts are performed.

We chose Lake Piru, Ventura County, as our main location for the taping. We had our normal first day jitters, but everything was going

(Continued on page 66)

Products

(Continued from page 63)

low-noise characteristics. This combination of good limiting action, low noise and low distortion is ideal for demanding applications in the broadcast industry.

The ITI-TLC 666 Bridging Amplifier provides monitoring capability. Its input impedance of 100K ohms assures that a bridging connection will not alter the transmission characteristics of the line, introduce noise, or diminish the level of signals being monitored.

For More Details Circle (70) on Reply Card

Remote TV Antenna

Nurad, Inc., has developed a new circularly polarized transmit antenna called the Goldenrod. The Goldenrod, to which Nurad has given the designation Model 20 HE1, is approximately equivalent in performance to a two-foot parabolic antenna with feed, but presents far less wind loading, is much easier to handle and store, and less susceptible to damage from handling. As such, it is well suited for use as a transmit-antenna complement to Nurad's Quad Polarized 2 GHz Receive Antenna System that is now being employed by over fifty metropolitan stations in their remote TV broadcast operations.

For More Details Circle (71) on Reply Card

Tape Velocity Indicator

Pacific Recorders and Engineering has announced the availability of their TVI (Tape Velocity Indicator). a digital variable speed (±33%) for use with the MCI JH-110, JH-100, and JH-114 tape recorders.

Ten-turn vernier speed control provides the fine adjustment capability to shave time off a "61 second" spot, sharpen a flat, compensate for off-speed tapes, and accomplish any number of special effects, such as flanging and delay. Front panel button switching selects between fixed (crystal) and variable speed.

For More Details Circle (72) on Reply Card

Zoom In

(Continued from page 64)

well. The next shot was to involve two stunt cars and a motor cycle. The cycle was to race through a dirt gully while our car was chasing the other on a paved road. At a particular point, the cycle was to cross between the two racing cars.

The cameraman at the taping that day was Bob Keyes who was stationed on the road at the crossover point. Bob was using the hand-held "90". I, with a PCP 70, was positioned on a hill overlooking the entire stunt. Tape was rolling as the cars sped towards us....Suddenly, the unexpected happened! The cycle was a second or two late at the crossover and the second car had to swerve to avoid colliding with the cycle which was now airborne.

At that point the accident happened. The second car was now in an uncontrolled skid and Bob and our Mobile Unit were in its path!

It all happened in seconds. The car hit Bob and then collided with the Compact Mobile Video Unit.

You can imagine the panic. Everyone ran to see how Bob was. When I got there, I saw Bob lying under the car.

Roger Harbaugh, acting as camera assistant, was also lying on the embankment. Bob was hurt, but we didn't know how badly. Roger was shaken, but OK. Fortunately, the unit manager had arranged for an ambulance to stand by for the entire taping and so Bob was immediately taken to the hospital.

Later, we were told about Bob's injuries. X-rays revealed several cracked ribs and minor bruises but otherwise he was all right. Our prayers were answered. The amazing Bob, cameraman that he is, came back two days later to finish his job...."

Take 2!... JIM SCHOONMAKER at WCIX... (Miami, Fla.)

(What are some of the typical "chores" that ASTVC members find themselves involved with at their various stations throughout the USA? Jim Schoonmaker relates his day.)

"Opns personnel at CIX work in both the studio and ON-AIR ops since all breaks are reel-to-reel (film and VTR). Thus, there is a four-person on-air crew: switcher, audio/log-keeper, projectionist, and tape operator.

People tend to move around among the different jobs, including running camera in the studio. I do audio, projection, and some camera. I'd like to get into tape (I've already done some of that) and then switch.

On-the-air ops are very harried because every break is local, but if you can handle things here, another station would be no problem."

(Thanks for your report, Jimmy. If it's any comfort to you, the Nightly News control room seems to be "slightly harried" from time to time...so you see, you're in good company.)

Take 3!... NEW ADDRESS!...

Please take note of the mailing address for applications, inquiries, etc. Send them to: BOX 296, Sparkill, New York 10976. Articles for the column should continue to be sent to: BOB ZWECK, Room 670, NBC, RCA Bldg., NYC 10020.

provements are still needed to reflect the full quality potential of the NTSC system.

It will probably be at about this time that a 1,000-plus line, high resolution, jumbo screen television system will be introduced. Already two rather promising approaches to greatly shrinking the RF bandwidth required for the broadcast (or cablecast) of high resolution video have been unveiled. The emerging popularity of video projection systems will undoubtedly accelerate the need for a high resolution system. A television system with over 1,000 lines would provide the same resolution as average 35mm motion picture film, such as used at your local motion picture theater. Or, to put it another way, a system with 1,000-1,050 lines would make it possible to focus a high resolution camera (we've got those too) on this page and viewers at home would be able to read every word. A high number of lines such as this, coupled with the supporting bandwidth capability, effective in-

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U.S. Color

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ment, has not had the luxury of consistently going with "top of the line" equipment and being able to justify the engineering hours required for an uncompromising engineering regimen. In the majority of other countries TV quality standards were initially set by a public-funded television system that did not find itself in a strict cost-competition situation.

The Future of U.S. Quality

There are already some signs that U.S. consumers are becoming much more concerned with video and audio quality. The public awareness about hi-fi audio equipment in radio and recordings is testimony to the fact that a large percent of the public can recognize the desirability of a higher quality and even be willing to pay for it.

Once this generation of color receivers saturate the consumer market and viewers become accustomed to a stable color picture, something will have to be offered to entice potential buyers to upgrade their receivers. A number of im-

SBE (Continued from page 45)

screening and testing with computerized circuit-board testing. *(H. J. "Bart" Paine, Chairman, Chief Television Engineer, University of Arizona, College of Medicine, Tucson, Arizona 85724, (602) 882-6644).*

Chapter 36: San Diego, Calif.

Chapter 36 met on Thursday, February 26, at KCST in San Diego to meet Mr. John Baumann of Broadcast Communication Devices, Inc. He reported on a new convergence editing system for video and acquainted members with other equipment made by Optec Engineering. *(Bill Montgomery, Secretary/Treasurer, SBE, 6841 Convoy Court, San Diego, California 92111, (714) 556-8080).*

Chapter 37: Washington, D.C./ Northern Virginia

SBE members in the greater metropolitan area held a joint meeting in February with the Audio Engineering Society at the WTTG studios in Washington, D.C.

Central Florida

One of the more recent, soon-to-be-chartered Chapters held its meeting in February at the Channel 24 studio in Orlando. Mr. Terry Lloyd, of TFT, and Mr. Dick Cunningham, of BCS Associates, Inc., held a slide show and seminar on EBS. A discussion period followed. *(John Weyrick, Chairman, 5765-F Kingsgate Drive, Orlando, Florida 32809, (305) 857-3729).*

U.S. Color

(Continued from page 67)

terlacing, etc. would render the scanning lines almost invisible, even for a screen measured in **feet** at a close viewing distance. Under these conditions television would no longer be basically a "close-up medium," since the eye would be able to select details or small areas from the large screen to concentrate on, much the same as it does in theatre or in "real life."

Possibly, just as the United States pioneered the way for color television in the world, we can also introduce a practical high resolution television system which would again be the basis for a world standard in the coming decades. And, maybe this time political egos, or whatever, can be pushed aside for an internationally compatible system which will facilitate the exchange of programming between the countries of the world. Could **engineers** make possible international channels of communication where **diplomats** and **politicians** have failed? □

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WANTED (CONT.)

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EQUIPMENT FOR SALE (CONT.)

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ENGINEER-ANNOUNCER with First Phone, AM & FM combo experience, maintenance at directional AM. Technical school graduate, military tty electronics experience, CET. Seeking permanent employment in broadcast engineering or comboman position near central Indiana. Age 30. Send name and address with info on position. Kenneth R. Garvick, R.R. #1, Box 304-M, Pittsboro, Indiana 46167. 4-76-1t

HELP WANTED

TECHNICAL HELP—needed immediately, experienced engineers for TV remotes, Slo-Mo, VTR editing, Transmitter and ES operation. Send resume and salary requirements to P.O. Box 7817, Atlanta, Georgia 30309. 4-76-1t

ENGINEERS with first phone for southwestern VHF, studio and transmitter. Experienced or beginner, but must have equivalent of trade school or military training. Paid holidays, vacation, retirement plan and other benefits. Send brief resume with past earnings history and present salary requirements to Chief Engineer, KOAT-TV, P.O. Box 4156, Albuquerque, NM, 87106. 4-76-1t

TV SYSTEM ENGINEER WANTED. Graduate engineer, experienced in Microwave and CATV systems to work in system planning and installations for largest MDS operator. Approximately 25% travel. Contact Microband Corporation of America, 176 Broadway, New York, New York 10038. 4-76-2t

MOVE UP from your present job in broadcast engineering. We handle all engineering jobs and openings coast to coast. Send full resume confidentially now. The AMPS Agency, 6331 Hollywood Blvd., Suite 623, Los Angeles, Calif. 90028. Tel: (213) 462-7301. 8-73-tf

PART-TIME SUPERVISION: MATV installations your city. $200.00 day possible. Melvin Cohen, 1620 N. Federal Highway, Boynton Beach, Fla. 33435. 4-76-9t

ELECTRONIC TECHNICIAN—operation and maintenance of Norelco, Ampex and CDL equipment preferable. Opening available immediately at full service Mid-west quad tape facility. Send resume and date available to: Dept. 350, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 4-76-2t

MANAGEMENT ENGINEERING ASSISTANT to join staff of public television Engineering Department. Must have three to five years professional experience in engineering management position. Require excellent digital logic experience along with top technical skills and demonstrated administrative ability in union shop. Resumes only to Jay Rayvid, WQED-TV, 4802 Fifth Avenue, Pittsburgh, Pennsylvania 15213. WQED is an equal opportunity employer. 4-76-1t

HELP WANTED (CONT.)

ASSISTANT ENGINEER (COLLEGE INSTRUCTIONAL TV DEPT.). Full-time permanent non-exempt position. Experienced. Installs & repairs TV and other electronic equipment. Modifies custom made electronic equipment. 40-hour week. Ideal working conditions with loads of benefits. For interview (212) 969-8000, extension 373, St. John's University, Queens. 4-76-1t

TELEVISION CHIEF ENGINEER—Responsible for designing, installing, and maintaining all UNI television facilities (including a recently completed color production/distribution system). Five or more years of closed circuit color experience, including switching, optical projecting, and helical VTR's. Position requires FCC first class Radio-Telephone License, completion of a two year technical school in electronics, and five years of television experience or any combination of related training and experience totaling seven years. Salary range is $13,322 to $16,308 depending on training and experience. All applicants must apply before May 3, 1976.

All interested applicants should apply directly to:

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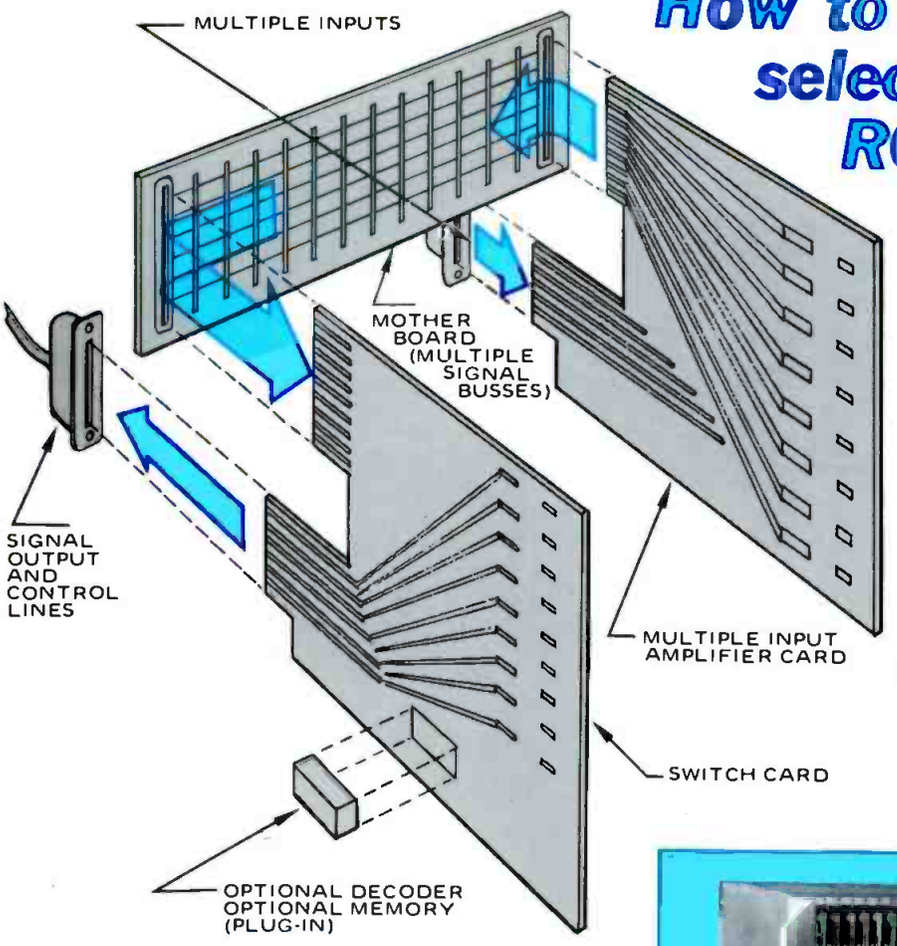

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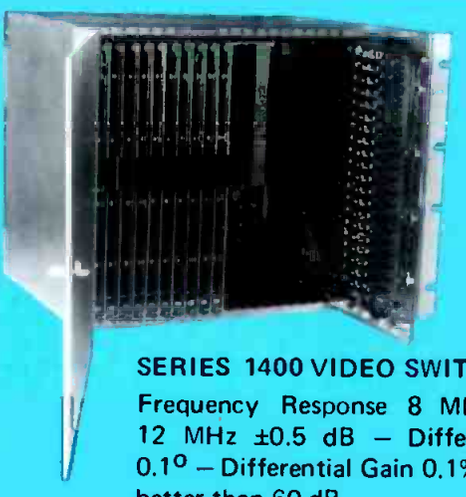

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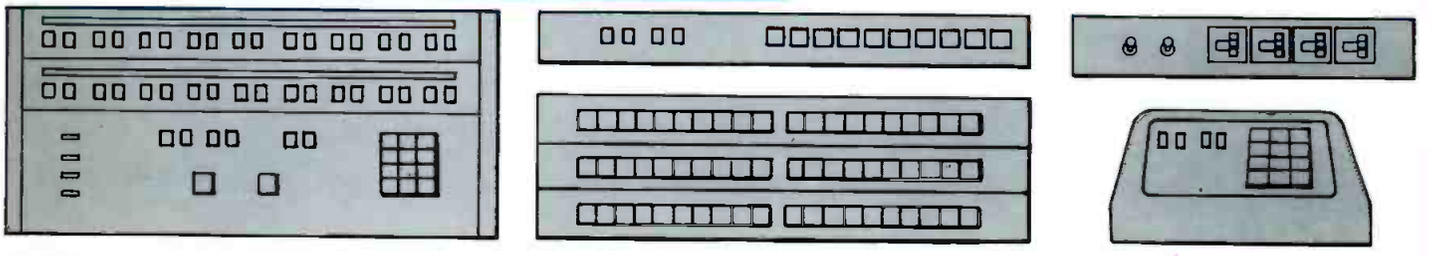

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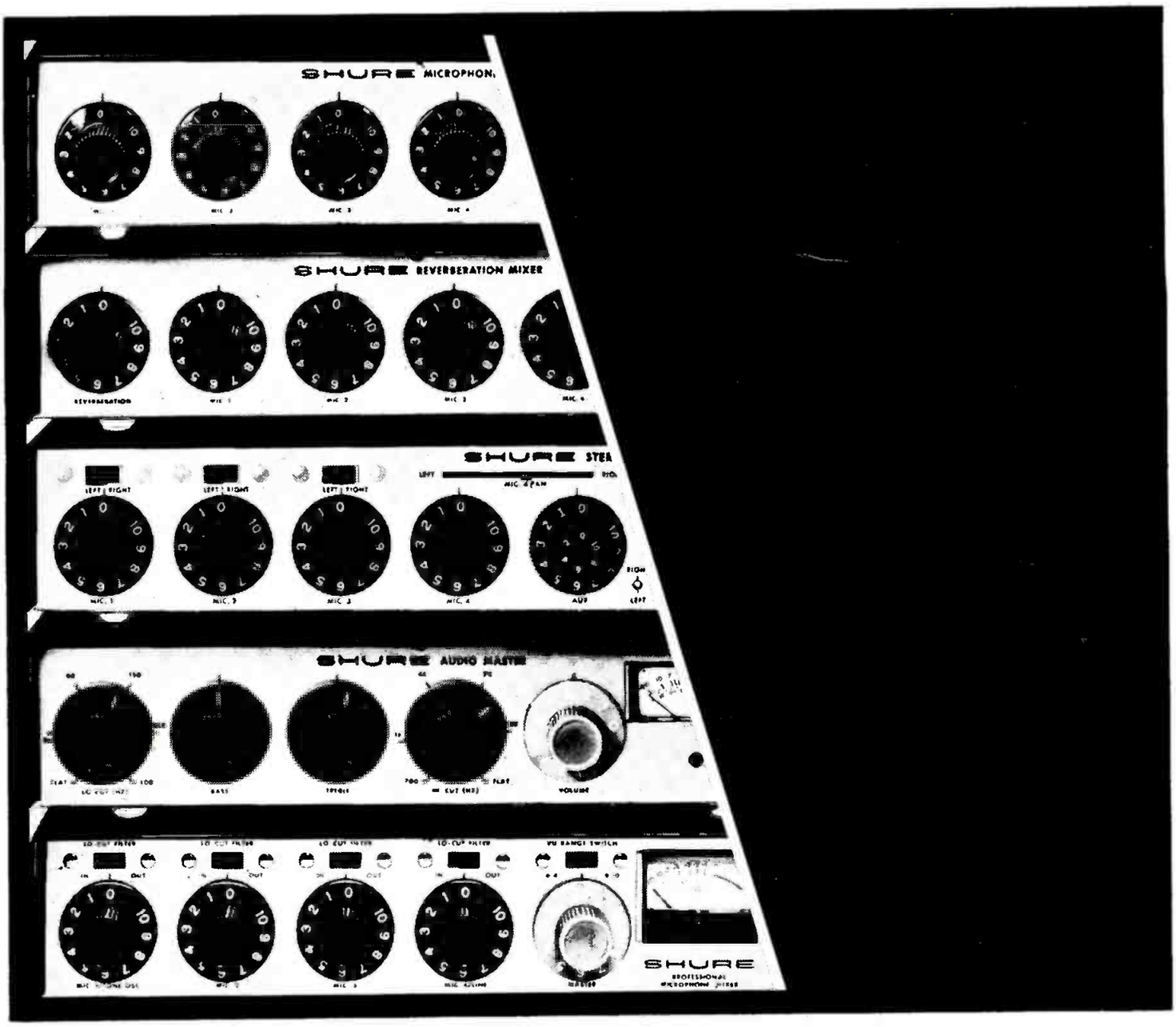

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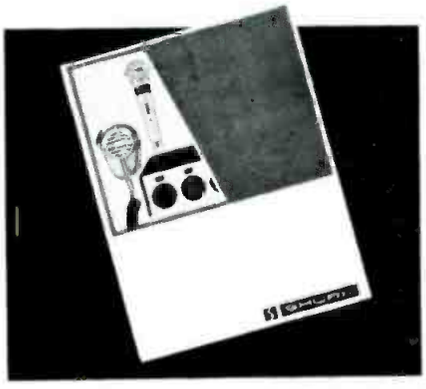

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