BROADCAST ENGINEERING®
May, 1974/75 cents

NAB convention in review

Is it live or is it Memorex?

(All unretouched photos.)

With Memorex Chroma 90* Video Tape even Jack Calaway couldn't tell.

Eyes don't lie. Or at least not very often. That's why we asked Jack Calaway, VP Engineering and Operations of Trans-American Video, to loan us his expert eyes for a test.

Here's the test.

First we put Jack in front of a professional broadcast TV monitor. Then we alternated between a live picture (the one at the left) and a Memorex Chroma 90 Video Tape picture.

After Jack had studied both for several minutes, we asked him which was live and which was Memorex.

His answer: "I really thought I could tell the difference . . . but I can't."

*Chroma 90 is our broadcast video tape. Of course, we also make the very highest quality of helical scan tapes, including video cassettes. No matter what kind of video equipment you've got, chances are we've got a tape that'll surprise you.

MEMOREX VIDEO TAPE.

Reproduction so true we can ask, "Is it live or is it Memorex?"

Think smaller!

You don't have to carry an albatross around your neck . . . or 75 lbs. on ur back and shoulder to shoot great video tape in the field.

And you don't have to wait for hours—or even days—to see the film you've ot.

AKAI's VTS-150—a *totally portable color* VTR system—takes the burden your back. Weighs just 22 lbs. Completely compatible with any other video uipment you're now using. And provides direct on-the-air broadcasting capa- ties when used with any of the time-base correctors available today.

It's battery or AC operated. So it goes wherever you go. Which means u'll never need film again. Or film processors, soundmen, film editors, lighting hnicians, deliverymen, directors, lab men, etc.

The AKAI VTS-150 is a *complete* color VTR system. Including a mpact color camera with 6-to-1 zoom lens, servo-controlled iris and lt-in microphone . . . viewfinder/playback monitor . . . and a color order that utilizes inexpensive 1/4" video tape. Plus automatic ting control, stop-motion and sound dubbing capabilities.

Don't let its small size fool you. The VTS-150 is a superbly gineered *professional* color VTR system with many of the features nd in video systems costing many times more.

And the smallest part of the system is the price. Only $6495.

: Price subject to change out notice.

Mail the coupon today for complete information.
AKAI America, Ltd./ BE-4
2139 E. Del Amo Blvd,. Compton, Calif. 90220

- ☐ Please send me literature on AKAI's new Color VTR System.
- ☐ Please send me literature on AKAI's Black & White Systems.
- ☐ Please arrange a demonstration of the above.

Name _____ Title _____

Firm _____ Phone _____

Address _____

City _____ State _____ Zip _____

om
AKAI™
e Innovators
AI America, Ltd./
39 E. Del Amo Blvd,.
mpton, Calif. 90220
(213) 537-3880

For More Details Circle (4) on Reply Card

May, 1974 • Volume 16, No. 5

BROADCAST engineering®

The technical journal of the broadcast-communications industry

in this issue...

About The Cover

The NAB theme prevails and this time there are three articles devoted to covering the hottest topics at the Convention. Cover photos were taken by Donna Roizen of Telegen, and layout is by Webb Streit.

Departments

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

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

Controlled Circulation postage paid at Indianapolis, Indiana.

Robert E. Hertel, Publish

INTERTEC PUBLISHING COR
Subsidiary of HOWARD W. SAMS & CO., IN

DIRECT CURRENT FROM D. C.

May, 1974

By Howard T. Head

VHF TV Drop-Ins Proposed on Large Scale

A proposal has been filed with the Commission by the United Church of Christ to implement the "plan" prepared by the White House Office of Telecommunications Policy (OTP) for the "drop-in" of 62 VHF TV channels in the top 100 television TV markets (see last month's Broadcasting Engineering). The UCC petition, accepting the feasibility of the OTP proposal at face value, urges the Commission either to assign the new channels for educational use or to reserve them for licensees representing minority group ownership. Actually, as noted in last month's article, there are serious questions as to whether more than a fraction of the proposed OTP channels can be assigned without doing serious violence to established TV reception.

Also getting into the act is a group representing the State of New Jersey, lamenting the fact that New Jersey has no commercial VHF TV channel assignments (neither does Delaware) and asserting that those parts of New Jersey near New York and Philadelphia are being slighted in the treatment of New Jersey in news, merchandising, and public affairs. New Jersey does have commercial UHF assignments, but apparently these don't satisfy the New Jersey people.

Supreme Court Overturns FCC's Cable Fee Structure

The U.S. Supreme Court, overturning a Court of Appeals Decision, has ruled that the FCC must make a fresh start in establishing the schedule of fees imposed by the Commission on CATV systems. The law providing for the levying of fees by Federal agencies is intended in general to permit the agency to recover that portion of its budget which represents benefits to applicants and licensees. In the case of cable systems, the Supreme Court ruled that the Commission did not establish that the fee structure did in fact represent benefits to the industry being regulated, as distinct from benefits to the general public.

The case has been remanded to the Commission for restudy, and in the interim the existing CATV fee schedule has been suspended. Although the decision has obvious implications with respect to fees charged broadcast licensees, the actual implications to broadcasters are far from clear at the present time.

Deadline Extended on DA Monitors

All standard broadcast stations employing a directional antenna are required to utilize a type-approved antenna monitor. In the case of stations employing other than first-class operators, the deadline for the installation of a type-approved monitor is June 1, 1974.

the Bauer 707 was 'just right' in its day

THE SPARTA 701B IS 'JUST RIGHT' TODAY!

In the tradition of the most successful broadcast transmitter in history, the Bauer 707, now comes the SPARTA 701B:

THE NEW MODEL 701B SPARTA/1kw AM TRANSMITTER IS THE ONLY ONE MANUFACTURED TODAY WITH EVERY ONE OF THESE 'JUST RIGHT' FEATURES AS STANDARD EQUIPMENT!

- **All solid state, right up to the finals**
- **125% positive modulation**
- **Tally light overload indicators**
- **New long-lived 4-500 tubes**

Plus these and other time-tested SPARTA/Bauer 'just right' quality features; oil filled modulation transformer, built-in dummy load, vacuum capacitor final tank tuning.

Did you know...
Sparta manufactures a full line of AM and FM transmitters, and audio products? Look to Sparta for EVERYTHING in your broadcast equipment needs.

SPARTA
ELECTRONIC CORPORATION
5851 Florin-Perkins Road, Sacramento, Ca. 95828
916 383-5353 TELEX 377-488 CABLE SPARTA
A DIVISION OF COMPUTER EQUIPMENT CORPORATION

For More Details Circle (6) on Reply Card

(Continued from page 4)

The Commission has learned that some stations are having difficulty in obtaining timely delivery of type-approved phase monitors. Consequently, the FCC has extended the deadline. However, this extension is applicable only if the licensee has placed with the manufacturer and received confirmation of an order for a type-approved monitor. If this has been done, but the monitor has not been received by the deadline date, a copy of the purchase order and confirmation must be furnished the Commission in Washington, and an additional copy must be maintained in the station's files and made available for Commission inspection on request.

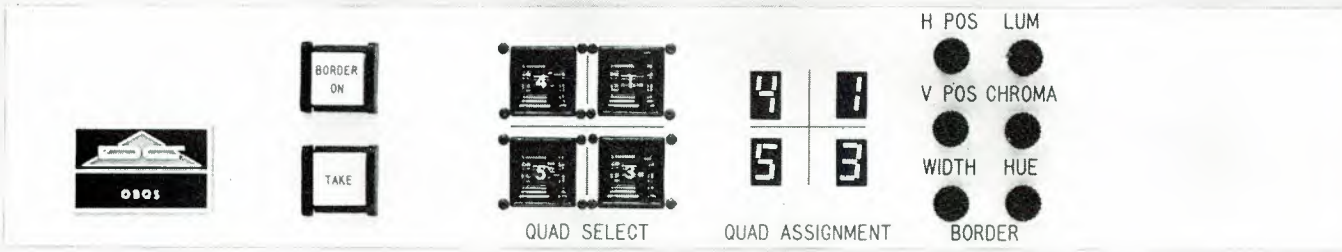
More UHF TV Land Mobile Sharing Proposed

The Commission has proposed additional sharing of the lower UHF TV channels with the land mobile radio services in three additional metropolitan areas. Channel 14 would be used by land mobile in Miami, Channel 17 in Houston, and Channel 16 in Dallas/Fort Worth. The engineering requirements for the protection of TV stations would be the same as in the other 10 markets where sharing is already permitted. In order to accommodate the sharing, the Commission has found it necessary to shift vacant channel allocations in five cities in Florida, Oklahoma and Texas.

Short Circuits

The FCC/Industry Cable TV Technical Advisory Committee (CTAC) has held a briefing session for representatives of the Governors of the 50 states...Another AM licensee (this time in West Virginia) has narrowly escaped being penalized by the Commission for use of an inaccurate coverage map...The Commission has instituted a broad general inquiry into all aspects of automatic logging...The Commission has authorized the testing of alternate techniques for detecting leakage radiation from cable systems...Further Commission re-regulation has resulted in the relaxation of various Rules, including Commission notification of operation with reduced power...The Commission has authorized an FM station to transmit visual (yes, visual) information by means of an SCA...The Commission's Cable Bureau has established a Cable Complaint Service, to deal with complaints from the public about quality of CATV service.

OB/QS[äb-/kwiz]*n*: (one bus quad split) A device manufactured *only* by American Data Corporation: a device which generates a quad split effect using *no* switch buses on your primary switcher: a device which now provides a quad display as a *primary* switcher input: a device which may be used with *any* switching system with as few as two buses or as many as (?): a device which sells for $1250, or $1600 with colorized borders: a device *you* should have.



Model 1290 "O B Q S"

AMERICAN DATA CORPORATION

AMERICAN DATA CORPORATION

AN AIRPAX COMPANY

315 WYNN DRIVE, N.W. P. O. BOX 5228 HUNTSVILLE, ALABAMA 35805 TEL. 205-837-5180

ADC SOUTHEAST	ADC SOUTHWEST	ADC MID-ATLANTIC	ADC NORTHEAST
DAVE SPINDLE	RUSSELL TREVILLIAN	DWIGHT WILCOX	JOHN SULLIVAN
205–837-5180	713–941-7272	301–460-1454	617–237-2600

For More Details Circle (7) on Reply Card

INDUSTRY NEWS

FCC Rules Changes

As a result of the continuing study on the re-regulation of broadcasting, the Commission has amended certain provisions on Parts 0, 1, 73 and 74 of the rules, to up-date certain rules and delete parts of others which are no longer applicable. The Commission said it believed that these amendments would be to the benefit of many and to the detriment of none, and would better serve the public interest.

Rules regarding applications for temporary permission to operate standard and FM broadcast stations with licensed operators of lesser grade than required by the rules, were amended to include operators at noncommercial educational FM stations. The requirement that certification be submitted regarding lesser grade operators after temporary permission has been granted was deleted. Amendment was also made to clarify the requirements allowing for appointment of a substitute operator, on a pro-tem, non-fulltime basis, in the event the station's regularly employed operator becomes incapacitated.

Reduced Power

Other changes permit broadcast stations to operate at reduced power in emergencies, or to limit or discontinue their operating schedules in the event it is impossible to adhere to their operating schedules due to situations beyond their control, for a period of not more than 30 days without further authority. The Commission, however, must be notified not later than the 10th day of such operations, and if normal operations begin prior to the expiration of the 30 day period, the Commission must be notified of the date that normal power was restored or the date the station returned to its authorized operating schedule.

Operating Logs

Rules requiring a station's chief operator to review each day's operating logs within prescribed time periods were revised to include the time of the review, as well as the date and the chief operator's signature.

Unattended Operation

Conditions pertaining to unattended operation of aural broadcast STL, intercity relay, TV intercity relay or TV STL stations, have been changed to require appropriate observations at the receiving end of the circuit by the operator be made at intervals of not more than three hours. These modifications conform with the change from 30 minute meter readings to three hour meter readings in the operating log rules in the AM, FM, noncommercial educational FM and TV services.

Comments From TelePrompTer on Copyright

Chairman and Chief Executive Officer Jack Kent Cooke made the following comments concerning the decision in the CBS v. TelePrompTer case:

"The decision by the Supreme Court in our favor today ends a long period of litigation concerning the copyright liability of cable television operators. We are tremendously pleased by this vindication of our position that cable television operators should not be required to pay copyright fees because of their interception and retransmission of broadcast signals. Ultimately these fees would, of course, have had to be paid by the cable television subscriber."

The decision is actually the second Supreme Court adjudication of the matter. In 1968, the Supreme Court ruled against the imposition of copyright liability in a case which involved two systems which are now owned by TelePrompTer. The latest decision held that development since the 1968 decision of new cable television functions—importation of distant signals, program origination, sale of commercials, interconnection with other cable television systems —even though they may allow cable systems to compete more effectively with broadcasters for the television market do not subject cable television operators to liability for copyright infringement.

Cooke also applauded another Supreme Court decision announced requiring a reappraisal by the Federal Communications Commission of the annual fees which the Commission had imposed on cable television companies. Cooke said, "This is still another case where the cable industry has had to fight to avoid the burden of superflous charges, and it is another case where the reward has made the battle worthwhile."

For Latest News See Direct Current page 4

First Domestic Satellite Gets April Launch

America's first domestic communications satellite was launched for Western Union by the National Aeronautics and Space Administration on April 11, 1974.

The launch marked another historic event for Western Union in pioneering communications for the nation. In 1861, the Company completed the first transcontinental telegraph line, cutting coast-to-coast transmission time to minutes from the 10 days required by Pony Express.

The first satellite will increase by many times the capacity of Western Union's terrestrial transcontinental microwave system and create new superhighways of communication.

Over this information network can flow greatly improved services, totally new in scope and benefits. The satellite is expected to have early impact on such services as banking, news coverage and travel.

A demonstration of "space mail," in the form of Mailgrams, will be one of the first uses of the satellite.

Mailgrams are a form of electronic mail utilizing Western Union's transmission and computer switching capability to send messages into serving post offices across the U.S. for expedited letter carrier delivery.

The 1,265-pound spacecraft, called Westar I, is the first of three satellites in Western Union's projected space network. It was sent aloft in the nose of a Thor-Delta rocket.

Westar I is 11.8 feet in total height and contains 20,448 solar cells. Its diameter is 6.3 feet.

When it becomes fully operational in late summer, Westar will be capable of transmitting all major forms of communications including voice, video and data and graphics.

The spacecraft has 12 transponders, each designed to receive and retransmit the equivalent of one color TV signal with accompanying audio, 1,200 one-way voice circuits, or data traffic at the rate of 50 million bits per second. In terms of messages, this means that each satellite can relay more than 8 million words per second.

The April satellite launch came only 15 months after the system was licensed by the Federal Communications Commission.

In August, 1970, Western Union filed an application with the FCC for a proprietary U.S. domestic communications satellite system using the Hughes Aircraft HS-333 spacecraft.

During the subsequent two years spent determining U.S. domestic

"I take it, then, that you don't want to be on TV?"

satellite policy, Telesat Canada adopted the same spacecraft and has since launched two HS-333's bearing the name Anik. Their excellent performance in orbit has reinforced Western Union's confidence in the soundness of its early choice.

A second Westar spacecraft is scheduled to be launched in June, and a third completed unit will be held in reserve as a ground-ready spare for possible launch in October, 1974.

Each Westar launch is insured. The insurance coverage amounts to $24 million per launch.

Western Union's investment in the Westar satellite system is about $90 million. The figure includes three spacecraft; five earth stations serving the metropolitan areas of New York, Atlanta, Chicago, Los Angeles and Dallas; associated microwave facilities to connect to the five serving cities, and insurance. These earth stations interconnect the satellites with Western Union's 8,000-mile transcontinental microwave network.

Roizen Given Award

Joseph Roizen, President of Telegen and a Video Consultant has been awarded the EMI Premium by the Royal Telcvision Society of Great Britain. The award was made for a paper presented to the Society in London on June 6th, 1973 on the Rank Cintel 9000 Broadcast Video Tape Recorder.

Roizen was a consultant on this project from its inception until November 1973, and assisted with the introduction of the video tape recorder at the International Broadcast Conference in London, September 1972, and the Montreux Television Symposium May 1973, and the Society of Motion Picture Television Engineers Fall Conference in New York October 1973.

He was invited to receive his prize at the Royal Television Society Flemming Memorial Lecture held in London in April. Roizen has been a member of RTS since 1960, and has been previously awarded the Wireless World Premium for a paper on Color Video Tape Recording.

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

SBE Presidential Message

At the Annual meeting and the Board meeting held March 17th at Houston, plans were made for several mini-conventions to be held on a regional basis starting next fall, publication of a newsletter for members to supplement our section in B.E., and greater contact with our chapters through the Board of Directors.

I have appointed Larry Taylor, who was the coordinator of the first mini-convention held last fall in New York, as chairman of the committee to plan a series of regional mini-conventions. These will be designed for broadcast engineers who are unable to attend the NAB convention on a regular basis.

I discussed our plans with a number of manufacturers at the NAB convention and I was surprised to learn that they are all very much in favor of the mini-conventions and will provide their support for this project.

There was a considerable amount of discussion concerning the future direction the membership might wish the Society to take. In that connection I would like to repeat a portion of my remarks to the annual membership meeting.

QUOTE: "While I was checking the files for items of unfinished business, I noticed that Bob Flanders had talked about the need to communicate when he was President. It seems that we still have that problem. The communication path obviously is two-way and while I certainly do not consider the Headquarters to member portion of this path, to be completely satisfactory I believe we have made some improvement. Our special section in B.E. has provided an information exchange which we have not had for several years. I believe we could and should make better use of it.

I would like to comment on the feedback portion of this communication path.

During this past year we have tried to get input from the chapters and membership, on the directions your Board should take, on the FCC re-regulation Task Force, nominations for Board members, and articles for publication. The amount of feedback has been almost zero.

We all want the Society to grow into a real force in the broadcast engineering profession but your Board cannot accomplish this if there is no input from the membership to give us the sense of direction we need."

Broadcast Engineering Editor Ron Merrell in a very thought provoking speech at the annual meeting hit the question of what the SBE is and should be, very hard. All members will receive a copy of Ron's message in the first issue of our Newsletter. There will also be a questionaire which will help the Board determine the future course of your Society.

I would also like to thank the outgoing board members Bob Cox, Hank Van Amburgh, John Wilner, and Ben Wolfe for their service to the Society. Ben and John will continue to serve on the Certification Committee.

We had planned a report on the status of the Certification project at the annual meeting but due to the illness of chairman Ben Wolfe this had to be delayed. We will continue to work on this important task as soon as Ben is able to persuade his doctor to allow him to return to his normal activities.

Again, thank you for your support during my first term as president. All of the officers and directors are determined to continue the

Jim Wulliman addresses the annual meeting and introduces the new SBE Board.

growth of the Society and to make it a significant voice in the broadcast industry.

Jim Wulliman
President, SBE

The Society of Broadcast Engineers, Inc., held its 10th Annual Meeting on March 15th at the Rice Hotel, Houston, Texas with leadership of the society to continue under James C. Wulliman, WTMJ Stations, Milwaukee, President; Glenn H. Lahmann, KDKA, Pittsburgh, Vice President; and Robert Truscott, WITI-TV, Milwaukee, Secretray Treasurer.

Members of the Board of Directors who were reelected are **Albert H. Chismark,** Broadcast Division of Meredith Corporation, Syracuse, N.Y.; **Edwin T. Karl,** WSNL-TV, Suburban Broadcasting, Central Islip, N.Y.; New Board members starting office include **James Grinnell,** ABC Television Chicago; **John Lyons,** WWRL-AM, Woodside, N.Y.; **William Orr,** WBNS Stations, Columbus, Ohio; **Bart Paine,** College of Medicine, University of Arizona, Tucson, Arizona; and **Robert Wehrman,** WIIC-TV, Pittsburgh, Pennsylvania.

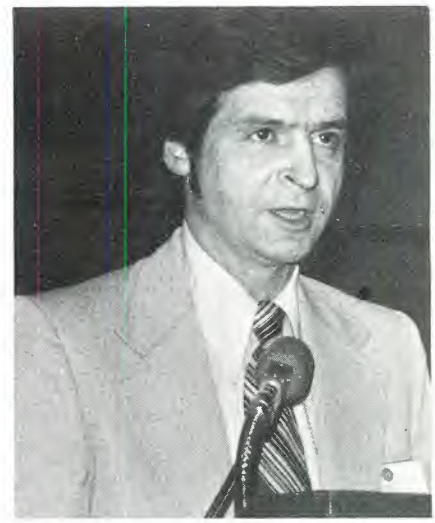
SBE Directors continuing in office for another year are **Steve de-**

Satnick, D.E., WCVB-TV, Needham, Mass.; **Robert W. Flanders,** V.P. Engineering, McGraw-Hill Broadcasting Company, Indianapolis, Ind.; **Eugene Hill,** V.P. Engineering, Kaiser Broadcasting, Oakland, Calif.; **Charles morgan,** Ass't. D.E., Susquehanna Broadcasting Co., Avoca, Pa.; and **Leo Reetz,** Allocations & R.F. Systems, American Broadcasting Company, New York, N.Y.

Those elected to Fellow are **Harold E. Ennes,** author, Broadcast Engineering Publications, Indianapolis, Ind.; **Joseph A. Risse,** International Correspondence Schools and University of Scranton; **Leo Reetz,** RF Engineer, American Broadcasting Company, New York; **Orville J. Sather,** Director of Engineering, WOR, New York; and **Martin R. Williams,** Consulting Engineer, Indianapolis, Ind.

In addition to these five members elected to Fellowships, three past presidents of the Society who previously received this honor and were presented their Fellowship Diplomas at the meeting: **Robert Flanders,** Vice President, Engineering, McGraw-Hill Broadcasting; **Lewis Wetzel,** Dielectric Communications; and **Albert H. Chismark,** Director of Engineering, Meredith Stations.

The diplomas were presented by Charles T. Morgan, Susquehanna Broadcasting Company, who is Chairman of the Fellowship Committee; other committee members are John Wilner, Public Broadcasting Company of New Jersey, and Benjamin Wolfe, Post/Newsweek Stations.



Broadcast Engineering editor Ron Merrell addresses the annual meeting of the SBE. Bent on putting the industry in perspective, Merrell said "Never in the history of broadcasting has the engineer been more important to the broadcast industry. He must be heard, because it's the engineer who must interpret the new technology."

Chapter 11: Boston, Mass.
Chairman: Ross Kauffman,
Needham, Mass. 02194

The January meeting featured John Shilling of Weston Instruments who talked on the advances in multimeters, counters, and other instruments. The meeting was held at WGBH-TV. Chairman Kauffman at (617) 449-0400, or Secretary-Treasurer Steve Cohn, WSNW-TV, (617) 852-0027, may be contacted for information on future meetings.

Chapter 15: New York, N.Y.
Chairman: John M. Lyons,
Woodside, N.Y. 11377

The New York chapter meets on

the 2nd Thursday of each month, September through June, usually at the WQXR Presentation Theater, 9th Floor, of the **New York Times** Building, 229 W. 43rd St.; optional, delicious, and reasonably priced dinner available after 6 PM in the cafeteria on the 11th floor. Non-members are welcome.

Chapter 16: Seattle, Wash.
Chairman: John A. Maxson, Issaquah, Wash. 98027

On March 13th, at the Norselander Restaurant, Dale Manquen of Ampex Corporation, who is sales engineer of their magnetic tape products division, spoke on new developments in helical and quad machines, and on stereo simulcasts on TV-FM. Manquen supported his talk with slides. Bob Dietsch of the FCC reported on recent developments on Commission activities.

Chapter 20: Pittsburgh, Pa.
Chairman: Henry R. Kaiser, Pittsburgh, Pa. 15212

On March 21st, Norm Cleary of Audio Innovators, Inc., provided a program on Modern Audio Production Facilities. The meeting was held at noon at Buddies-Upstairs. Future meeting information is available from Earlene Rutledge, WWSW engineering secretary, 391-3000.

Chapter 21: Spokane, Wash.
Chairman: T. O. Jorgensen, Spokane, Wash. 99201

During meetings held at the Castle Restaurant, Spokane, including lunch and discussions, topics covered on December 3rd, 10th, and 17th, and on January 10th, included Audio Harmonic and Intermodulation Distortion, SCR and Triex Control of Power Supplies, Data on IVC 500 Color Camera, and Testing of Meters by Patterson Electronics. Previous meetings covered UHF Klystron Efficiencies, a report from Ron Valley, chief engineer of KSPS, on National Education Television Engineering Committee, Small Color Cameras and Slant Track Recorders, 2C39 Tubes in UHF Translators, TDR Measurements, Diesel Engines and Alternators, and Satellite Repeaters. All members and nonmembers are welcome. For information on future meetings, held weekly, call Jorgey at (509) 328-9084.

Chapter 22: Central New York
Chairman: Mort Miller,
Syracuse, N.Y.

The chapter meetings are usually held the 3rd Thursday of each month, generally at the Northway Hilton Motor Inn, Interstate 81 and N.Y. Thruway, Syracuse, with optional dinner at 6:30 PM. Information on future meetings is available from Chairman Miller at (315) 446-4780. The March 21st meeting centered on the Headend, Syracuse Newchannels, Fayetteville. Joe Majczak, chief engineer hosted the meeting, demonstrating spectrum analysis, displaying waveforms, and answering questions. This is one of the latest and most elaborate CATV systems, providing subscribers with 21 channels in the VHF band.

Chapter 23: Portland, Me.
Chairman: Dave DeBree,
Portland, Me. 04103

The Portland chapter normally meets on the second Tuesday of each month, usually at the Holiday Inn, Exit 8, Portland. Information on meetings is available from Chairman DeBree, WLOB, (207) 775-2336.

Chapter 25: Indianapolis, Ind.
Chairman: Joe Missick,
Indianapolis, Ind. 46202

Meetings of the chapter are generally held the 2nd week of each month, usually on Tuesdays, at various radio/TV stations. Further information is available from chairman Missick at (317) 924-4381.

Chapter 26: Chicago, Ill.
Chairman: Bradley Anderson,
Univ. of Illinois,
Chicago, Ill. 60680

The February 21st meeting, presided over by Bob Churchill, vice chairman, was held at ABC Studios. RCA presented a talk by Dr. Matti Siukola on Circular Polarizaton in TV, which is not currently authorized although it is used in FM transmission. ABC is conducting experiments from the Sears building tower. The March meeting was at Motorola in Schaumberg, Illinois. Further information from chairman Anderson, (312) 996-7912.

Chapter 32: Southern Ariz.
Chairman: H. J. "Bart" Paine
Tucson, Ariz. 85717

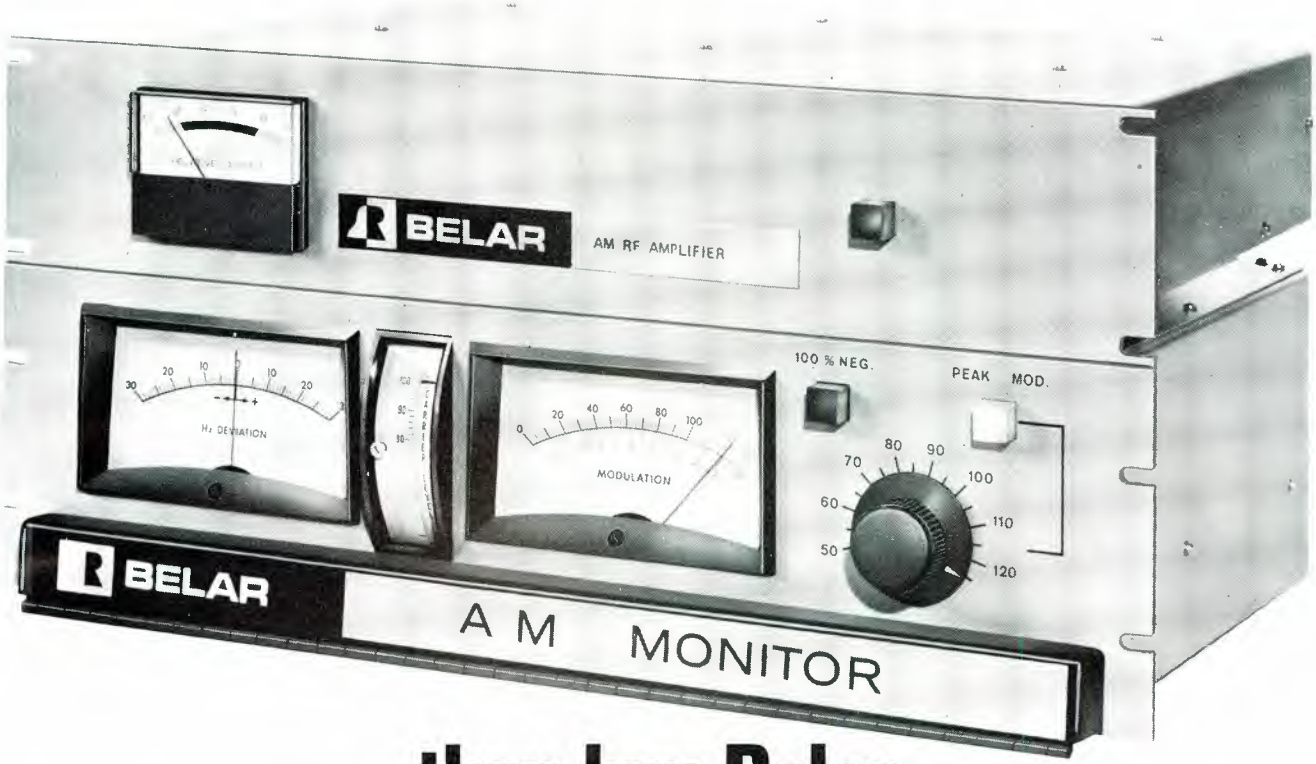
On March 26th the chapter met at the Straw Hat Pizza Palace. Those attending were treated to all the pizza they could eat, courtesy of Dalis Electronics and Ed Loya, Manager. Gerry Carne and Charlie Newcommer of RCA Tube Division provided a program on tubes. A review of happenings at the SBE Annual Meeting and at the NAB Convention was provided by members who had attended in Houston on March 17-20th.

Chapter 28: Milwaukee, Wisc.
Chairman: Ed Wille,
Milwaukee, Wisc. 53218

On March 12th, the chapter met at Midwestern Relay Company, Rubicon, Wisc., the company that provides the entire state of Wisconsin with microwave TV network service. Barry Dobbert, Area Operations Manager, reviewed the various services provided by Midwestern and the equipment used in the system. Questions and answer period followed.

Require Accuracy?

(and peace of mind)



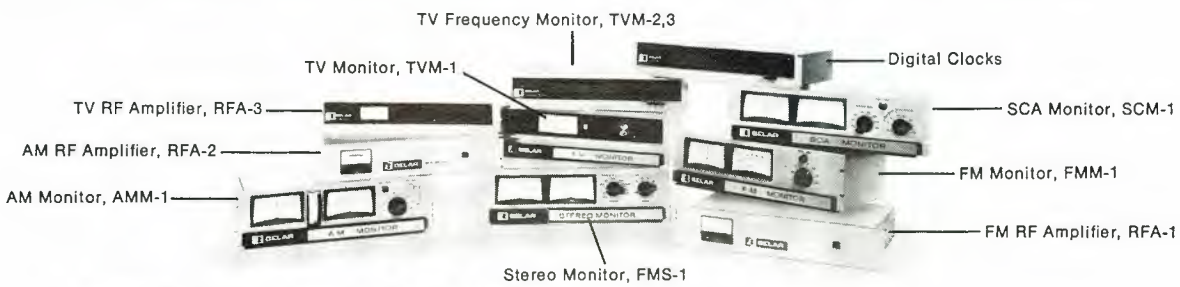
then buy Belar

Here's why:

■Separate 100% negative modulation peak indicator lamp—*detects the absence of carrier on program peaks for a true 100% negative indication.*

■Normal peak indicator lamp may be set to +125% —*an accurate measurement to keep you within FCC modulation limits.*■Built-in true modulation calibrator —*means that you can check the modulation calibration at any time.* ■ True peak reading modulation meter—*switchable to read either positive or negative peaks, to accurately measure the short duration program peaks encountered in today's programming.*■ Expanded scale carrier level meter—*allows the accurate measurement of carrier shift.* ■Extremely low distortion demodulator—*permits accurate proofs at 100% modulation as well as accurate measurement of program peaks.* ■ Built-in off-frequency alarm drivers—*permits unattended measurement of frequency—alarm alerts you to any off-frequency condition.* ■ Digital counter circuit—*will measure any standard broadcast band frequency spaced 1kHz.*■ Built-in ±20 Hz frequency calibrator—*allows you to check the calibration of external equipment such as automatic loggers.* ■Built-in carrier-off alarm—*tells you when the transmitter is off.* ■Off-air monitoring with the addition of the RFA-2 RF Amplifier—*wide range AGC means hands-off operation at the studio.* ■100 μV sensitivity with RFA-2—*handles the most difficult receiving problems with ease.*

For further information call or write today.



BELAR
ELECTRONICS LABORATORY, INC.
LANCASTER AVENUE AT DORSET, DEVON, PA. 19333 • BOX 826 • (215) 687-5550

Where Accuracy Counts . . . Count on Belar

For More Details Circle (19) on Reply Card

Crossing the battle lines, competitors were carefully eyeing the format differences. Here IVC rep looks into the Ampex AVR-2

NAB engineering highlights

By Ron Merrell

Quad vs. Helical

As predicted, the Quad versus Helical competitive battle lines were firmly drawn when the convention began. It began there, because the major contenders were exhibiting in such close proximity that no one could miss it. In a short circuit walk you could see equipment operating, listen to the claims, and pick up format position papers. You could see, for example, that Quad mountain was being invaded by Helical valley, and they knew it. The results will be a long time coming in. After all, it will be the industry engineers mulling this over who will decide the outcome. Competition will be keen. So far we've only progressed to the point where all concerned admit that there's more than one way to skin a cat. And it's the engineers who eventually will decide whether, considering individual applications, one or both will survive.

In Tune With The Times

Before we get into the sessions reports, here's a suggestion. Read the convention management coverage article in this issue. In this way you will be up-to-date on the latest industry actions and reactions that sooner or later will affect your station. It's our contention that the engineering profession should be vitally concerned and involved with the problems of the industry.

Joseph B. Epperson, engineering vice president for the Scripps-Howard Broadcasting Co., has received the 1974 Engineering Award of the National Association of Broadcasters.

The award was presented during a luncheon at the annual Broadcast Engineering Conference, as part of NAB's 52nd annual convention.

Epperson, a veteran of 46 years in broadcasting, is the inventor of the "Signal Range Calculator," an easy-to-use slide-rule which quickly shows the "Grade A," "Grade B" and "Principal City" coverage of a UHF or VHF television station as well as the field strength of its transmitter.

He's also the author of many technical publications and during World War II served as a radar consultant to the Pentagon.

Epperson has served as the top engineering officer for Scripps-Howard since 1956. The company, based in Cleveland, O., operates six radio and television stations in four states—WEWS (TV), Cleveland, and WCPO (TV), Cincinnati; WPTV, Palm Beach, Fla.; KTEW (TV), Tulsa, Okla., and WMC-FM-TV, Memphis, and WNOX, Knoxville, Tenn.

He got his start in broadcasting in 1927 as an engineer at WNOX while studying for his degree at the

University of Tennessee. He was named WNOX's chief engineer in 1931 and seven years later became chief engineer for Scripps-Howard Radio.

Looking Toward 2000

At the luncheon, which usually features the engineer and someone well known to engineers, a renowned scientist and chairman of the board at Interand Corporation dazzled the audience with his prognostications of developments by the year 2000.

Noting the fast pace of technological knowledge in the past 26 years, Dr. Reiffel theorized that developments which are in their infancy or pre-conception stage now may be full-grown 26 years from now.

In the field of electronics, for example, Dr. Reiffel predicted that the "electron will give way to the photon," and new developments in optical communications, wideband circuitry and other forms of transmission will materialize in the coming decades.

He said that electronic equipment which costs many thousands of dollars today may become so inexpensive that it will lead to an age of "throw-away electronics."

In the field of transportation, Dr. Reiffel forsees new methods of travel, including nuclear powered airships (possibly based on the dirigible concept) which would have longer life easier landing and take-off capabilities, and more economic operations for heavy loads than current aircraft.

He conceives the year 2000 as still fraught with urban transit problems. He said that mass transsit will continue to face difficulties because of political intervention. Too many people can say "No" to a proposal, but no single authority can say "yes" to most aspects of transportation planning, he said.

Dr. Reiffel was most enthusiastic about the possibilities for space and energy development.

"By 2000 man will have decided a fundamental technological question," Dr. Reiffel said. "Do we burn the seas or the rocks?" He explained that current technology already envisions atomic power generated either from fusion of ordinary rocks or fission of sea water.

If any of these processes work, he said, scientists will have solved man's energy problems. He also suggested that people can change the way they use energy, and the long-range prospects for solving energy crises is good.

Cyclorama Lighting

A new method of cyclorama lighting for TV and film was described by Dr. William E. Glenn, director of research for CBS laboratories.

Dr. Glenn presented a paper jointly prepared with Salvatore J. Bonsignore, staff lighting consultant for the CBS network, to the Broadcast Engineering Conference held as part of the 52nd annual convention of the National Association of Broadcasters.

He discussed both optical and economic problems and disadvantages inherent in the present system of incandescent lighting, and described the development by CBS of fluorescent light sources for cyclorama lighting.

Citing advantages of such lighting, Dr. Glenn noted that the fluorescents provide a more even distribution of light over a large area, with less chance of "hot spots" or "black holes." The long linear shape of the tubes also more closely conform to the cyclorama configuration, and require fewer instruments, he said.

Savings in both energy and cost were noted, since "the power requirement for an equivalent area of 3' of cyclorama when using fluorescents is 36 amperes as opposed to 90 amperes for incandescent or a saving of 60 percent," Dr. Glenn said.

Also, cost of power for air conditioning the studio can be reduced by about 25 percent over all, since the heat generated by the fluorescents is considerably less than that generated by incandescent lighting.

"In new installations, the capital investment for air conditioning would be reduced by approximately

J. B. Epperson, NAB engineering award winner for 1974.

Harold Kassens (r.) of the FCC's Broadcast Bureau is always on hand and available. Both Kassens and Wally Johnson keep expecting to hear more from engineers in the field on Rules changes needed. They need your feedback.

INTRODUCING THE NEW ECONOMICS OF BROADCAST TELEVISION... AND A PRODUCT LINE THAT BREAKS WITH TRADITION

Here are two important new broadcast television products that make sense for today and the years ahead. They are the result of fresh creative thinking and the belief that today's broadcast environment demands a substantial reduction in equipment operating costs, lower initial purchase price—*plus* performance that exceeds the best the industry has known. The IVC-9000 Broadcast Videotape Recorder accomplishes these goals by challenging and surpassing existing quad concepts. The IVC-7000 Camera offers performance that equals or exceeds that of the best cameras now in use yet at a mid-range camera price.

That's what we mean by "the new economics." Let us help you break with tradition.

Changing the Picture in Broadcast Television

IVC

International Viceo Corporation

For More Details Circle (20) on Reply Card

An old timer in the business, Guffy Wilkinson, checks out his latest FM transmitter before the first delegates hit the exhibition area.

Cohu has found a unique approach to exhibits. Here you see a broadcast student from Loyola University operating one of the cameras. Several other students manned the controls at Cohu.

Of course the NAB always has its share of beauties. This one was caught relaxing between shows in the Philips booth.

Would you believe we ran the Shively antenna upside down last month. We got it straight this time by including people in the booth.

the same percentage," Dr. Glenn pointed out.

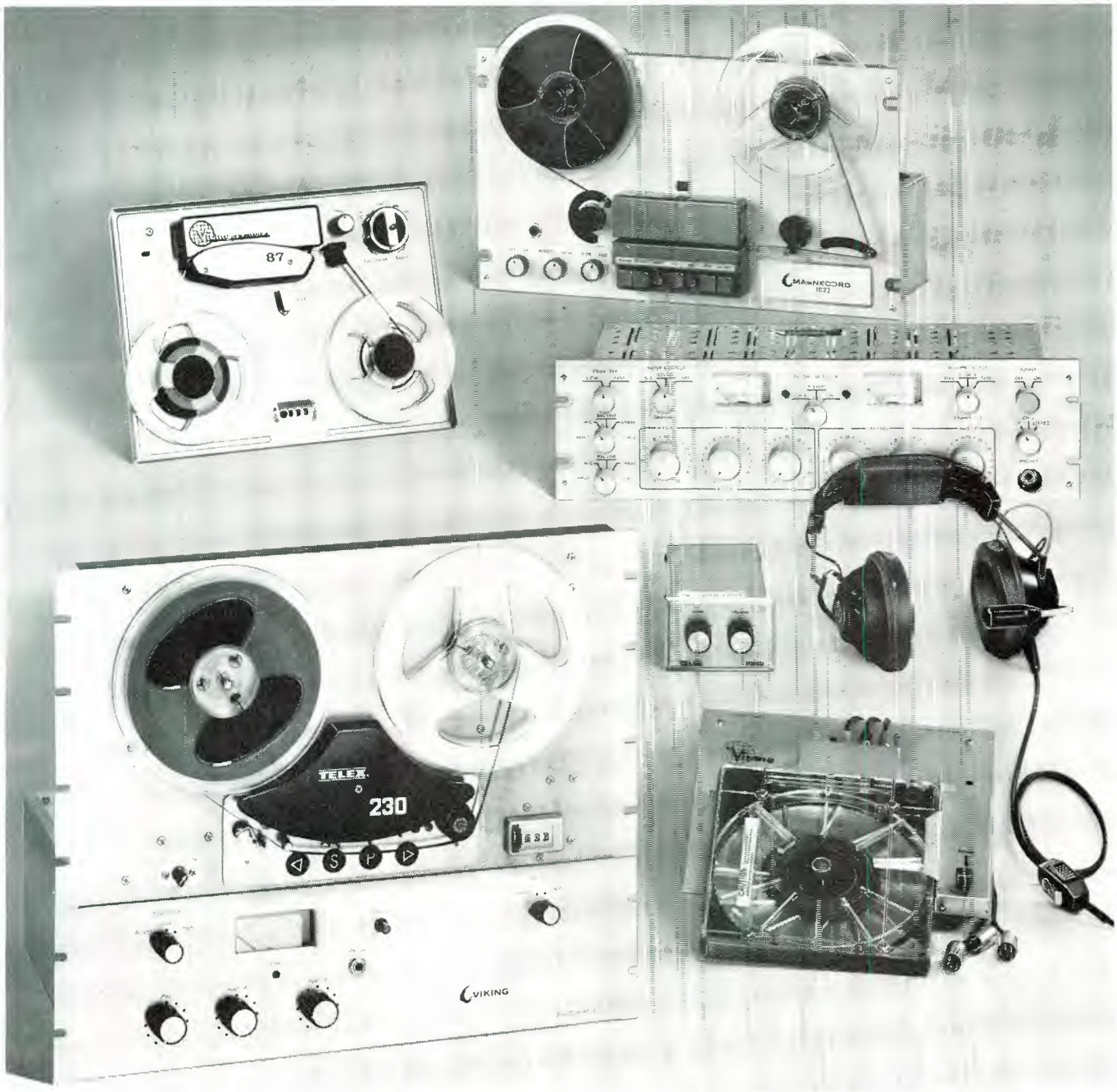
Other advantages cited by Dr. Glenn included:

- The number of dimmers required for control would be reduced by 60 percent.
- The fluorescent sources have a lumen per watt output of 78 compared to 28 for incandescent.
- The low temperature of the fluorescent allows employment of permanent color media which is never changed. This eliminates great yearly costs in labor and material.
- The permanent colors are an additive system of red, blue and green filtered to the same spectral response as the camera dichroics. This permits mixing of colors to generate any color reproducible by the camera. The band pass of the additive primary colors is narrow enough to permit efficient mixing and new color generation.
- The system produces any color temperature white.
- The color temperature does not change as the lights are dimmed to low levels.

Dr. Glenn said colors in the system are additive primary red, blue and green.

This allows use of a green trim filter with the green tube, a red trim filter with the red tube and a blue trim filter with the blue tube. The transmission of red light through red filter, green light through green filter and blue light through blue filter is naturally very high. Therefore, there is a minimum loss of energy through the filters.

"Most significant of all," he said, "is the fact that most of the energy used to energize the fluorescent red tube produces red light, most of the energy for the green tube produces green light and most of the energy for the blue tube produces blue light. These colors can be mixed directly with no loss. This is more desirable than a situation in which an incandescent white light must lose 90 percent of energy in the



For your every broadcast and tape equipment problem or need ...Telex.

You'll find that Telex has both quality and range.

From economical, manually operated tape cartridge transports to heavy duty, commercial/industrial three motor tape transports with hysteresis synchronous capstan drive.

And from compact, monaural tape playback preamplifiers to single and dual channel professional magnetic tape record/playback amplifiers.

For recording and reproducing sound of incomparable quality, of course look no further than the standard of the industry Magnecord series.

In fact, look no further than Telex for any and all of your broadcast and tape handling needs, including headphones. For literature, write Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.

PRODUCTS OF SOUND RESEARCH

TELEX®

COMMUNICATIONS INC

CANADA: Telak Electronics, Ltd., Scarborough, Ontario
INTERNATIONAL: Telex Export Dept., 9600 Aldrich Ave. S. Minneapolis, Minn. 55420 U.S.A.

For More Details Circle (21) on Reply Card

People just refused to sit down. Too much to see. At times the aisles were so crowded you had to take a seat to get close to the action.

Caught stretching. You have to attend the convention to appreciate this exercise.

Caught by the press. Bill McDonough (facing camera) takes time out to talk with reporters.

form of extracted red and green energy to produce blue."

Dr. Glenn said the employment of sources other than incandescent "opens a whole new field in television lighting." But he warned that there is still much to be learned.

"We must learn to what degree the interrupted spectra and the various cycle rates can be adapted to television use," he said. "The sizable advantages afforded by the new very high lumen per watt outputs and the much longer operating life of the new sources which cannot be ignored. As the state-of-the-art improves, we can be the beneficiaries of a new technology with unlimited horizons."

VIR And Color Reception

Insertion of a vertical internal reference (VIR) signal into color television broadcasts may be the means of improving considerably color reception on the home screen.

Such a VIR signal has been designed and recommended to the Federal Communications Commission for adoption industry-wide.

Bernard P. Loughlin of the Hazeltine Corp., Greenlawn, N.Y., presented a paper on the subject at the engineering conference.

Loughlin is chairman of the Electronics Industries Association's Broadcast Television Systems Committee which represents a cross-

section of broadcast network engineers, receiver manufacturer engineers and color television system experts. It was under the aegis of the EIA committee that the VIR signal was designed and recommended to the FCC.

Under present practices, once a signal has gone through a stabilizing amplifier and the sync and color bursts have been reconstituted, there is no real check to confirm that the burst and chrominance have a proper relationship. The problem becomes severe when video tape equipment is used.

Loughlin said FCC is considering a proposal to amend its rules to permit adoption industrywide of the VIR signal.

"The Commission," he said, "has followed closely the development of the VIR signal, and shares EIA's belief that its general use by those involved in the production and transmission of color programs will result in greater uniformity in color characteristics, as among programs, in the viewer's reciever."

Radio Station Design

Broadcast engineers were told that close cooperation with an architect is essential in designing a new radio station or remodeling an old one to avoid all "unwanted sound" and to assure peak studio performance.

Justin Henshell, AIA architect who has joined with Eric Small, a broadcast audio consultant, in designing a number of radio stations, presented a paper jointly written with Small to the Broadcast Engineering Conference.

Henshell said each type of station construction—a new facility, renovation of an existing building, or alteration of an existing structure—presents its own problems.

The foremost consideration in new construction, he said, is the choice of a site and the existence of noise. "Unwanted sound" can be generated from inside or outside a building, or can be produced by the station itself.

"It is less expensive to avoid unwanted sound than to construct spaces to control it," Henshell said.

Obviously to be avoided are locations in airway and flight paths or those near railroad tracks or drag strips. Steep hills near the station might reflect traffic noise. Nearby traffic lights could generate noise when automobiles and trucks shift gears.

Inside-building noise can be created by elevators, machine rooms, air shafts, storm water drains, steam pipes and air conditioning equipment.

"A radio station," Henshell said, "can be compared to a manufacturing facility in which the product is program. There is a clear separation between the office operation and the production function, but it is necessary to maintain a close interrelationship between them."

While the office operation spaces are comparatively easy to plan, the production facility—which includes studios, director, library, engineer and D.J.'s room—is more difficult.

"In planning the studio com-

plex," Henshell said, "spaces must be properly related to each other, isolated for sound, tuned for proper acoustics and should provide a self-contained environment."

He also described such mechanical requirements as heating, ventilation and air-conditioning, all operable on a 24-hour per day, 7-day week basis.

Turning to the electric/electronic requirements, Henshell emphasized that "a joint effort by the architect and the **station engineer"** is a must. Points to be covered, he said, should include "emergency power, design for access to electrical wiring, flexibility of conduit systems, and the proper location of racks, consoles and speakers."

TV Remote Control

The average TV station switching to remote control operations saves an average of 19 man days per week of engineering time, Malcolm W. Burleson of Burleson Associates, Inc., told the Broadcast Engineering Conference.

On the average, he said, remote operations have enabled stations to reduce their engineering staffs from 4.2 to 1.5 persons per station.

The results, he said, were based on responses by 509 television stations in a survey conducted last fall.

Burleson said 116 stations reported that they are now remote controlled; that 192 of the remaining 393 stations plan to switch over to such operations.

Burleson noted that the Federal Communications Commission's future goals include greater allowance of automatic transmission techniques as newer equipment and those wishing to use it come forward.

Super-8 Sound

A Super-8 camera equipped for sound, color film and an easy-to-use film processing unit were offered as providing smaller television stations with a simple and relatively inexpensive package for originating local news and documentaries in full color.

Hart Sweeney of Eastman Kodak Co., Rochester, N.Y., described the newly-developed system at the Engineering Conference.

Sweeney said the long-recognized need for such equipment stimulated his company to take on the problem and produce a system of particular interest to smaller stations because of the significant reduction in costs, materials and labor.

Sometimes this was all the closer you could get to a live exhibit.

Stereo Phase Shift

Those who listen to stereo broadcasts with monaural equipment often are needlessly disappointed with the quality of their signal. Correction of the "stereo mono-sum error" responsible can be easily corrected.

Ronald Eigenmann of Visual Electronics, New York, N.Y., discussed the problem and its solution.

Presenting a paper prepared by Ronald S. DeBry of Visual Electronics, Eigenmann said "stereo monosum error" is the cause of the unpleasant sound often received when monaural equipment is tuned to stereo. A stereo phase shift method recently developed can eliminate it.

"The correction of phase errors caused by reactive elements in descrete stereo channels and lines," Eigenmann said, "requires a system of isolating and quantifying phase shift in a manner that will ensure the phase error is not confused with normal amplitude variations, a means of acting on the most offensive elements in a complex signal, a method of referencing channel phase relative to 'common-mode' program material and then comparing this information to react and adjust the offending phase angle

within a few cycles without affecting program amplitude."

All this, he said, can be accomplished by installation of a stereo phase enhancer which has proven itself in actual programming installation.

"The phase correction process," he said, "reacts to phase but not amplitude variations and the reaction is immediate."

Low-Height Antennas

A new concept in low-height transmitting antennas was described to broadcast engineers by Homer A. Ray of Continental Electronics Co., Dallas, Tex.

He pointed out that such antennas are desirable in congested areas in locations subject to hurricanes, and where airport restrictions make it impossible to use antennas of normal height.

Ray said a newly-developed Perimeter Current Antenna—or PARAN—has proven useful throughout the frequency range where the vertically polarized ground wave is the principle means of radiation.

"Where FAA height restrictions prevail," he said, "it can be used at heights as low as 50 to 100 feet."

Also, he said, "it is structurally easier to harden small grounded towers as opposed to tall ones so that survival in hurricane areas can

Exhibitors often feel the advantage of conventions is the close-up demonstration.

No camera could capture the whole scene, because the Houston convention center was just too large. Even this picture shows only a fraction of the exhibits.

be achieved more readily. Small size also allows its use as an on-site emergency antenna in the event of damage to the main radiator."

Ray said a number of PARAN 50w antennas are in broadcast use overseas, and two basic, four-element models are now being offered in this country. Those offered in the United States, he said, about 50 and 100 feet in height, and "the system can be extended to even lower heights with the use of more elements if the need arises."

Unattended Transmitters

Unattended broadcast transmitters are feasible today and the only consideration in complete automation is its cost vs. its importance, according to T. M. Gluyas of RCA Broadcast Systems, Gibbsboro, N.J.

He said the Federal Communications Commission, in response to an NAB recommendation of a year ago, is moving toward adoption of rules covering automation of both radio and television transmitter systems.

"As soon as automatic transmitting systems are authorized," he said, "a practical and reliable system can be delivered." How far the concept toward a fool-proof system goes, he said, is a matter of cost vs. the importance of uninterrupted service.

Gluyas noted that unattended TV and radio transmitters have been in use in other parts of the world for many years. Systems operated in thinly-populated areas of south Canada and in Great Britain by the British Broadcasting Corp. were cited as examples. He said it is self-evident that a system for unattended transmitter operation must be reliable; that no matter how well-designed and made there is always a chance of random component failure.

"Program interruption can be avoided, in spite of such failure, by parallel redundancy or automatic switchover to a standby subsystem", he said. "Then, no matter what fails, a replacement automatically will be inserted or an alternate mode selected."

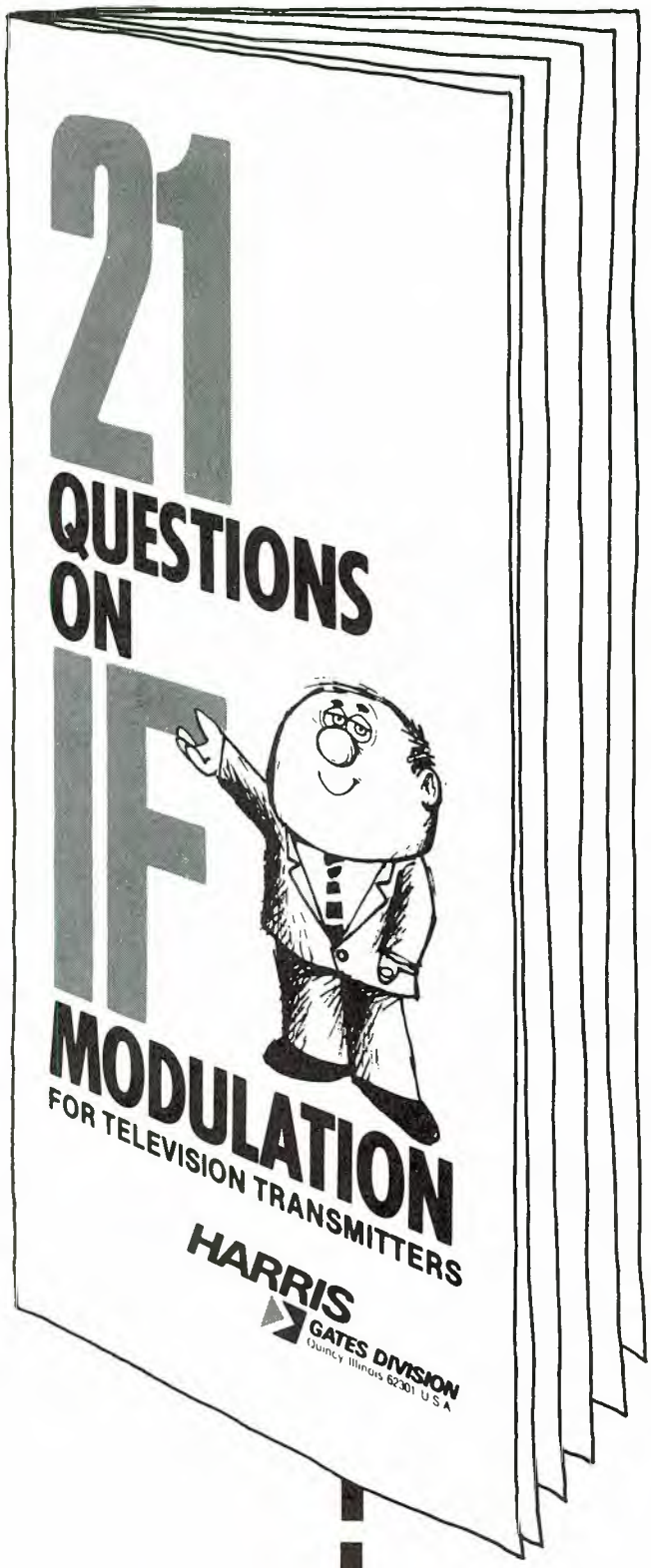
Gluyas said a 30-day "hands off" experiment recently was performed at KDKA-TV, Pittsburgh, Pa., to simulate unattended operation." Operators checked the system during the test as required by FCC rules, but kept "hands-off" the controls for the duration of the experiment.

"The experiment at KDKA," he said, "dramatically demonstrates that a modern television transmitter with auxiliary automatic controls can operate in an unattended mode. In fact, the experiment indicated that such a system probably will maintain modulation levels to closer tolerances than typically attained in manual operation."

TV Audio Performance

Principles of TV audio standards were reviewed for members of the Broadcast Engineering Conference by Hans Schmid of the American Broadcasting Company. He entitled his review: **Audio, The Stepchild of TV Broadcasting.**

Schmid reminded his audience that the audio performance of a TV broadcasting plan is determined by the EIA Recommendation for Audio Facilities for Radio Broadcasting, WIA RS-219.



This little booklet will tell you why IF MODULATION is the world's standard for television transmitters

21 questions—and 21 answers—on Intermediate Frequency (IF) Modulation, and why it is today's state-of-the-art approach to color transmission.

What is IF MODULATION? What are the benefits of IF MODULATION? Why is IF MODULATION superior? These are just a few of the points covered.

There are also more specific questions, and answers, on the technical aspects of IF MODULATION. All designed to tell you about the real improvements in recent VHF and UHF color television transmitter design.

HARRIS
GATES DIVISION
Quincy, Illinois 62301, U.S.A.

Gates Division
Harris-Intertype Corporation
Product Marketing Department 200
Quincy, Illinois 62301

Yes, I'm interested. Please send me a copy of your IF Modulation booklet.

Name _____

Title _____

Company _____

Street _____

City _____ State _____ Zip _____

VIDEO TAPE CONFIDENCE

RECORTEC equipment will relieve your VTR of all time consuming functions not related to revenue production.

Video Tape Conditioner

- Extends tape and head life by removing loose oxide and debris from tape surfaces.
- Improves quality of video recording due to reduced dropouts.
- Minimizes tape damage by improving the tape pack.
- Options such as erase, splice count, audio playback, etc., are also available.

Video Tape Evaluator

- Display total number of edge damages.
- Display total number of surface defects.
- Display total tape time.
- Tape fully cleaned, uniformly packed and degaussed.
- Increases VTR utilization.

Plus additional capabilities

- Audio Playback
- Video Tape Addressing
- Video Tape Tailoring

RECORTEC, INC.

777 Palomar Avenue
Sunnyvale, California 94086
(408) 735-8821

VIDEO TAPE CONFIDENCE

AND

RECORTEC

GO HAND IN HAND WITH THESE CUSTOMERS

Los Angeles

ABC-TV
AFRTS
Ambassador College
Apollo Film & Tape
CBS-TV City
Consolidated Film
EVAL Services
JPL
KCET
KHJ-TV
KTLA
KTTV
KWHY
Metromedia
NBC-Burbank
Trans-American Video
Video Tape Co.
Vidtronics

New York

Advertel
American Pictronics
Directors Studio
EUE/Screen Gems
Grumman Data
Hughes TV Network
Reeves Cinetel
Tele-tape
WABC-TV
WCBS-TV
WNBC-TV
WNEW-TV

Many other installations throughout the United States

International Installations

Australia
Austria
Brazil
Canada
Chile
Denmark
France
East Germany
West Germany
Hong Kong, B.C.C.
Hungary
Iceland
Iran
Israel
Italy
Japan
Korea
Kuwait
Malaysia
Mexico
Netherlands
Norway
Peru
Portugal
Poland
Republic of China
Switzerland
Thailand
United Kingdom
Yugoslavia

Join this knowledgeable group today.
Include Recortec equipment in your videotape plans.

RECORTEC, INC.

777 Palomar Avenue
Sunnyvale, California 94086
(408) 735-8821

For More Details Circle (27) on Reply Card

NAB management review

By Ron Merrell

This year at the NAB annual convention it took several trips through the expansive exhibit hall to get an idea of what the technical developments trend would do to or for the industry.

The first trip through caught the obvious: there are a number of new hand held TV cameras available now. And there were additions to the number of companies offering time base correctors. What do they have to do with each other? Well if the hand held camera is used to record pictures at remote locations, chances are they are not tied into broadcast quality recorders. And it takes a considerable expense to tie down a machine like that to a van. So, if you don't happen to have a van, you don't even have the possibility for that expensive tied-down alternative.

Instead, you record on a recorder that has its unique design deficiencies and you get an unstable product....and dubbing that onto a master can be nearly impossible. The time base corrector takes care of the stability problem. And the question remains as to how far down in quality one might go in cameras and recorders. It's minimal possibility reminds one of the old computer refrain: garbage in, garbage out. In this case it could lead to unstable garbage in, stable garbage out! That could be, if the industry accepts minimal specs instead of broadcast specs.

The redeeming factor here is that there are some fine cameras and recorders available that could, when run through a time base corrector, be dubbed onto a master with a resultant excellent picture.

If you don't like that approach, you could go the microwave remote route and be live all the way. In the March issue, we covered the WVCB approach to microwave remotes and how they serve electronic journalism.

Surely the industry will demand further improvements in order to raise color performance. That's what we hope is a healthy prognosis for the broadcaster and the manufacturers.

But the reason for covering these new developments and possibilities in **Broadcast Engineering** is not to show you how alert we are at detecting what's new. What we did find was the opening of the flood gates on a new era in news reporting: Electronic Journalism. It should be no trick for the industry to conjure up new ways to put systems together to get greater coverage, immediacy, and profit.

We'll be seeing more and more on this subject, and we will watch for some real competitive maneuvering for position in the marketplace.

Let's get together. Well, at least for an hour. NAB president Vince Wasilewski (l.) chats with FCC's Chairman Wiley. The renewal picture brightened, but other heavy subjects are still hanging on.

President Nixon was invited to address the convention. What the NAB got was more what the President saw as necessary for improving his image. At least broadcasters had their turn at the open mike.

Turning serious, Wasilewski hit the heavy problems in his state of the industry address.

The Nixon Format

President Nixon brought his new super availability format to the convention, and it was interesting to behold. I mean with all the security guards and secret service agents anyone could be suspect. Crowds gathered early with every passerby carefully noted. Unfortunately, his address was not aimed at the NAB audience.

We'll not get into the politics of that meeting. **Broadcast Engineering** is using the pictures only to remind those beyond the top 50 markets that the **entire** broadcast industry is seen as a formidable modernday force. So forcefull is it that we were given the full treatment of the new Nixon format. And if you had been there you could have been part of the action. Or did you see Dan Rather playing his game?

Richard W. Chapin, president of Stuart Enterprises, Lincoln, Neb., and immediate past Board Chairman of the National Association of Broadcasters, has received the NAB's 1974 Distinguished Service Award.

The award — highest honor of the broadcasting industry — was presented to Chapin at the opening General Assembly.

Established in 1953, the award is presented to individuals who make "a significant and lasting contribution to the American system of broadcasting by virtue of singular achievement or continuing service for or in behalf of the industry in any or all phases."

Chapin, a 50-year old veteran of 20 years in broadcasting, began his career at KFOR, Lincoln, Neb., in 1953, as an account executive. While he came up through the business side of broadcasting, he has an equally solid background in news, programming and engineering.

NAB President On The Broadcast Year

Vincent T. Wasilewski, president of the NAB, said that many changes have occured in the world of broadcasting during the past year, "some welcome, others we could just as well have done without."

He made the statement in his keynote address to NAB's 52nd annual convention at the opening General Assembly in Jesse Jones Hall.

In noting progress during the past year, Wasilewski said:

"After 51 weeks of consideration, 17 days of hearings, 126 witnesses and 1209 pages of testimony, the House Subcommittee reported out a license renewal bill by a unanimous vote. A little more than a week later, the House Commerce Committee reported the bill out by a vote of 31 to 0.

"It is not a perfect bill...(but) H. R. 12993 is a reasonable bill, fair to broadcasters, and in the public interest."

The NAB president said a principal change in the past year that will have a major effect on broadcasters is the almost complete turnover in top personnel at the Federal Communications Commission.

"Two Commissioners have retired; a third—Dean Burch, the past chairman—has leaped from the frying pan into the White House," he said. "Thus, at the moment, we have three vacancies.

"In addition, Robert E. Lee's term is over in June, and unless he is reappointed, we will have four new faces on the Commission."

In discussing the license renewal bill adopted by the House committee, Wasilewski said it "reaffirms that broadcasters be responsive to their public—a concept which we have always endorsed—as a reasonable requirement for holding a broadcast license."

"It will help prevent the delaying tactics and the immense legal fees associated with these delays," he said.

"It forbids retroactive punishment at license renewal time for conditions that were present when a license was originally granted, such as ownership by a broadcast group, a newspaper or other media interests, large or small."

"It forecloses the one-bite-at-a-time nibbling away at ownership patterns which the Justice Department has sought to force the FCC to undertake," Finally, he said, the measure "extends the license period by one-third"—from three to four years.

Wasilewski urged his listeners to support this bill during its further course through the House and Senate.

Other progress cited by the NAB

president included deferral by the FCC of consideration of key issues "until a full complement of commissioners is aboard," he said. Primary among these, he said, is pay cable.

"Let me reiterate that we do not oppose traditional cable television; neither do we oppose pay-cable per se," the NAB president said, "but when the traditional cable uses our programming to build an economic base for it to siphon those very same programs to pay-cable, we certainly do vigorously oppose it."

Wasilewski voiced the hope that the new members of the FCC, as well as those remaining on the Commission, will decide the question "solely on the basis of where the public interest lies."

Other developments of the past year, both favorable and unfavorable cited by Wasilewski included:

(1) A Supreme Court decision invalidating the concept of a regulatory agency recovering its full operating costs through charges to the regulated industries. This, he said, would certainly result in lowered FCC fees to broadcasters.

(2) A Supreme Court decision relieving cable casters from copyright obligations under present law. He said it is his "candid opinion that the Supreme Court decision is in error: that with all due respect, the Justices did not understand the implications of what they did." He noted that Justice William O. Douglas, in his dissent, referred to "these acts of piracy (that) are flagrant violations of the copyright act."

Wasilewski also indicated some areas in which he felt changes were necessary. He cited the broadcasters "open invitation to the Commission to cut back on unnecessary regulation and paper work, to cast aside procedures which no longer served the public."

He also pointed to the tactics of the pressure groups to manipulate programming to serve their own ends, and urged that "the licensee must have the right to make his own programming decision with the **public** interest as the only test."

The NAB president also called for quicker answers by the government, and the cessation of attacks on advertising in the form of discriminatory legislation, saying that "you can destroy broadcasting by getting at its economic roots just as easily as you can by unwarranted intrusions into its programming or renewal procedures."

Finally, he called for full application of the First Amendment to broadcasters. "Broadcasting is the press," he said, "and the press must be free, for it is not only our freedom that we guard, but everybody's."

Richard Chapin, recipient of the NAB's 1974 Distinguished Service Award.

Convention Welcomes Chairman Wiley

"It is a distinct honor and privilege for me to address this 52nd Annual Convention of your great national organization. As I think back over all of the achievements and contributions to American life which broadcasting has made during a half century of service, I suppose it is only a natural human tendency to reflect on my own association with your industry. Indeed, it was some 42 months, 67 speeches and several hundred grey hairs ago that I first entered the hallowed halls of the Federal Communications Commission.

"The time and circumstances seemed to call for an assiduous attempt to review the Commission's procedures, to study pertinent precedents, to analyze the issues, to "learn" the industry (so to speak) and, indeed, to develop a regulatory philosophy of my own. And so, I set about to read everything of relevance that I could get my hands on—an effort which, hopefully, has not abated to this day. But, in the nature of things, I soon felt the need to gather other knowledge and other impressions beyond the confines of the printed page. Accordingly, I threw open my Commission door to all comers, made an effort to meet significant industry leaders and critics, traveled broadly into the nooks and hamlets of your heterogeneous industry, visiting in the process some 30 state associations, numerous radio and television stations and myriad individual licensees; and I began to think seriously about the appropriate role of government vis-a-vis our commercial broadcast system.

"The sum total of this experience caused me to form a number of objectives that I have tried to attain during my three and a half years at the Commission: to break down the wall of mutual suspicion, distrust and fear which traditionally have divided the FCC and its licensees; to demonstrate that the Commission is composed of normal human beings with whom industry problems and concerns can be discussed—openly and candidly—without apprehension of regulatory reprisal; to express more clearly our administrative objectives in order to promote understanding and thus improved compliance; to evaluate anew the Commission's rules and policies in light of these objectives to insure that our regulation of your industry is intelligent, pragmatic, clear-cut, and adequate but not excessive in terms of what the public interest may realistically require; and, finally, to recognize broadcasting for what it is: a changing, diverse and pluralistic industry, and to regulate it accordingly—with a special emphasis on the impact which uniform, across-the-board regulation may have on the small operator, that sometimes forgotten man of broadcasting serving that sometimes forgotten segment of our population.

"I know that not all of these objectives have been wholly achieved but, on the other hand, I think **you** know that an honest and sincere attempt has been made—and that, so long as I have anything to say

Exhibit traffic was heavy, as evidenced by this shot inside the CMX booth. Throughout the exhibits there were a great number of new equipments.
(Photo by Donna Roizen)

about it, it will be continued and intensified.

"But in thinking over what I would say to you today, I received some advice **not** to reiterate and expand on these initiatives—but to strike a new note and a new mood: no more the line of industry-government cooperation in serving the public interest; no more the concept of re-regulation in an era of consumerism and militancy; and no more—as this advisor saw it—the so-called role of Mr. Nice Guy. And I suppose there is no more sure-fire formula for a government official to receive accolade and acclaim in some quarters than to mount the regulatory pulpit and to preach a sermon of hell and damnation to the infidels of industry.

"But, ladies and gentlemen, I am not seeking popular glorification—this is probably my last position of public trust. And I am not trying to please those who would use the "public interest" as a shibboleth for some personal and very specialized pursuits. And, last but definitely not least, let me say clearly that I didn't come to Washington to make my reputation at your expense. As long as I am at the FCC—and, incidentally, I do plan to remain in office until 1977—there will be no cheap shots, no grabbing at the sensational but essentially empty phrase and no subversion of our basic freedoms under the assumed guise of the public interest.

"But if you were to take these words as a formula for a less than vigorous FCC, for an abdication of our true public interest responsibilities or for a laissez-faire program which—in light of the vexing problems facing this industry and our society today—can be translated in regulatory terms as benign neglect, you would be very wrong indeed.

"Instead, I want to put you on notice that I intend a Commission, well and efficiently run, which will have both the ability and courage to address and resolve every issue now before us and also those which—in serving the public interest—we will initiate or encounter in the future. In this connection, every personnel vacancy at the Commission will be expeditiously filled and kept filled; every pending matter of major consequence at the Commission will be given a deadline for completion and the deadlines will be met, and every Bureau and Office Chief at the Commission will become accustomed to my face because he or she will be seeing it both early and often. Without these procedures, without this effort, bureaucratic delay can only continue and—in light of an ever-expanding workload—can only increase. And regulatory action delayed is only too often regulatory action denied.

"I also want to tell you that we plan to continue our strenuous endeavor to facilitate Commission dialogue with both licensees and citizen groups interested in improving our broadcast system. I believe that open and informal conferences between the Commission, licensees and the public can lead to better understanding, better regulation and better and more responsive broadcasting.

"Accordingly, I am pleased to announce today that—in May of this year—the Commission will launch the first of what we hope will be a series of FCC regional meetings, designed to take the government out of Washington and back to the people where they live, work, look and listen. Our initial and experimental program will be in Atlanta, Georgia, and will consist of a two day session, one devoted to a discussion and explanation of Commission rules and policies with licensees from Alabama, Florida, Georgia, Tennessee, and South Carolina—and the other devoted to an open forum in which members of the listening and viewing public in this five-state area can exchange views with key staff members of the FCC and, indeed, with the Chairman of the Commission. Hopefully, all of us will learn some-

Year after Year... Crown equipment pays for itself

Reliable performance and superior audio quality give you years more valuable service, making that higher original investment a real bargain. Every piece of equipment is ruggedly constructed, rigorously tested and guaranteed to meet or exceed printed specifications. All circuits are outstanding for low noise and distortion, wide bandwidth and high frequency response. It's to your credit when you specify the manufacturer with 26 years experience in broadcast and professional studio equipment.

STUDIO MONITOR AMPLIFIERS

All models have complete internal protection. IM distortion is better than 0.05% from 0.01 watt to full power. All units mount in a 19-inch rack. Three year warranties cover parts, labor and round-trip shipping.

DC300A

delivers 150 watts RMS per channel into 8 ohms, or 600 watts output in monaural operation; height 7 inches.

D150

delivers 75 watts RMS per channel into 8 ohms; height 5¼ inches.

D60

delivers 30 watts RMS per channel into 8 ohms; height 1¾ inches.

DISTORTION ANALYZER

Model IMA tests audio equipment easily, quickly and accurately. Both intermodulation distortion analyzer and internal oscillators are enclosed in one compact unit. Even an inexperienced technician can take ten power level measurements in 5dB steps in just 60 seconds. The ranges are 100, 30, 10, 3, 1, 0.3, and 0.1%.

MAGNETIC TAPE EQUIPMENT.....*IN THE PRODUCTION STUDIO*

All models are designed to work 18 hours a day, 7 days a week for 10 years with three head replacements. Modular construction and plug-in circuit boards mean fast, easy field servicing. These precision instruments will make clean, accurate recordings years after the economical semi-pro decks are retired. All models handle ¼-inch tape and 7-inch and 10½-inch reels. All mount in 19-inch racks. Standard speeds are 15, 7½ and 3¾ ips. There are individual record, erase and play heads for 1 to 4 channels. Over 40 standard models are available with numerous professional accessories.

CX822 Mastering Recorder
computer logic control for safe, rapid tape handling and editing ■ full remote control optional ■ TracSync available ■ each channel has two mixing inputs and individual bias adjust and equalizers ■ third-head monitor for meters or headphones with A/B switch

...*IN THE CONTROL ROOM*

SP722 Studio Player
simple tape transport system has only 9 moving parts ■ remote start/stop optional, automatic stop in play mode

...*ON LOCATION*

SX822 Recorder/Mixer
integral mixing facility simplifies setup ■ same tape transport system and meter monitoring as CX822 ■ two mic or line inputs per channel

STUDIO TRANSDUCERS

Four models of superior quality speaker systems have advanced-design electrostatic elements for midrange and treble and acoustic suspension base woofers, for finest possible reproduction for the professional recording studio. Two models of excellent cone speakers provide fine sound for broadcast monitoring.

ES224

CROWN, Box 1000, Elkhart, Indiana 46514 Phone (219) 294-5571
Send technical data on Crown audio equipment for potential use:
☐ within Continental U.S.A. ☐ outside Continental U.S.A.

Name & Title _____

Company _____

Address _____

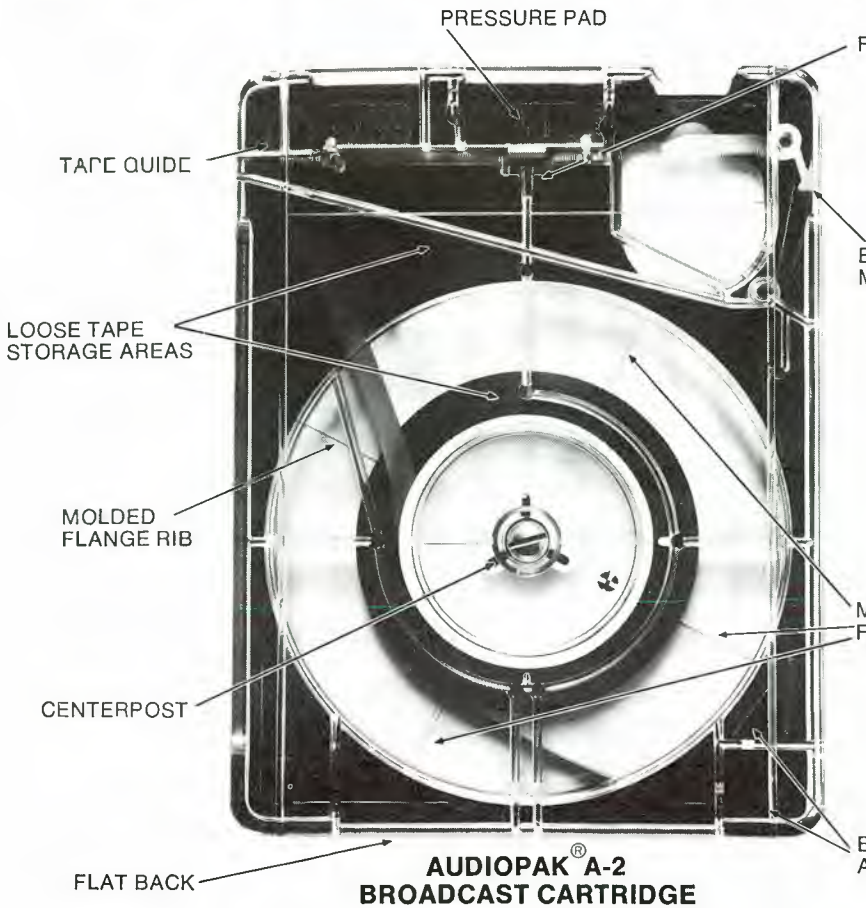
_____

MADE ONLY IN AMERICA

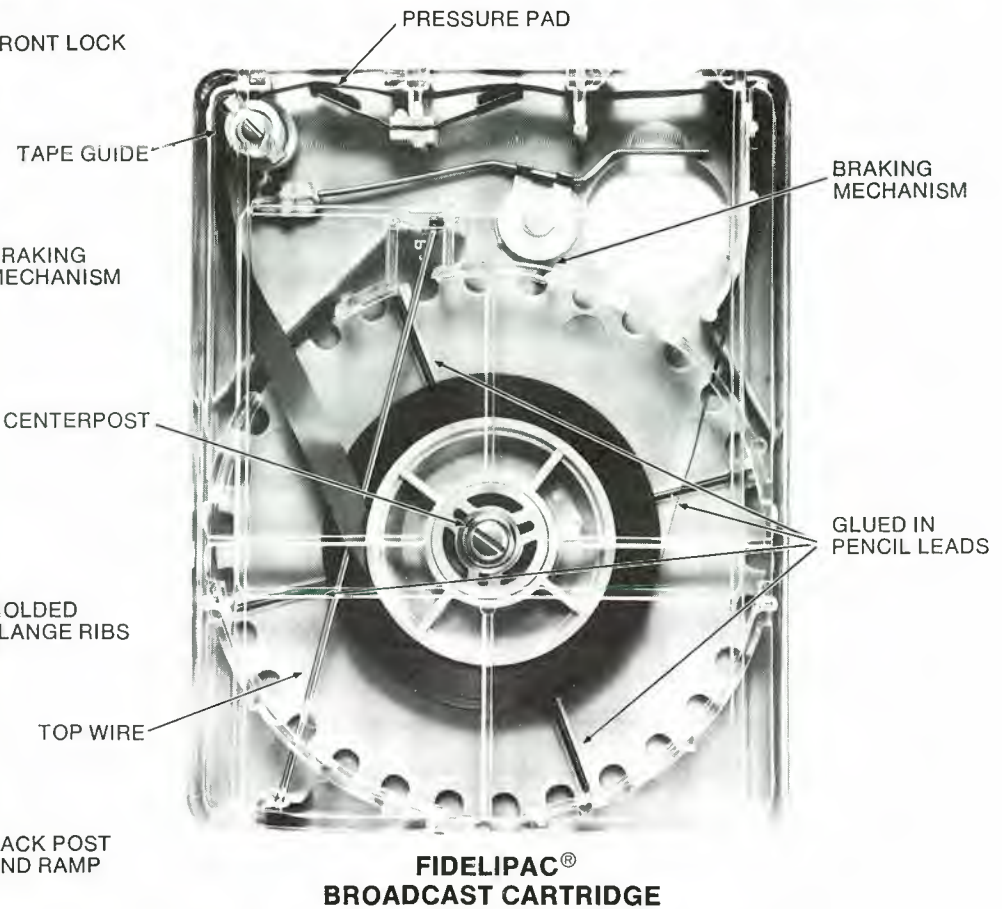
crown

Now we'll help you be the Judge.

There are at least 10 reasons why the Audiopak A-2 is beating out the competition. Here is Reason No.1. How many times have you had broken or missing pencil leads in a cartridge flange? Can't happen on the Audiopak. There aren't any! We mold the tape support ribs as an integral part of the flange. There are 9 other reasons: write for our literature and free cartridge.



AUDIOPAK® A-2 BROADCAST CARTRIDGE



FIDELIPAC® BROADCAST CARTRIDGE

AUDIO DEVICES, INC., A CAPITOL INDUSTRIES CO., 100 RESEARCH DRIVE, GLENBROOK, CONN. 06906 • MANUFACTURERS OF AUDIOTAPE,® AUDIOFILM® AND AUDIODISCS.®

thing worthwhile—substantively or in terms of human values—from the dialogue which will take place on these two days.

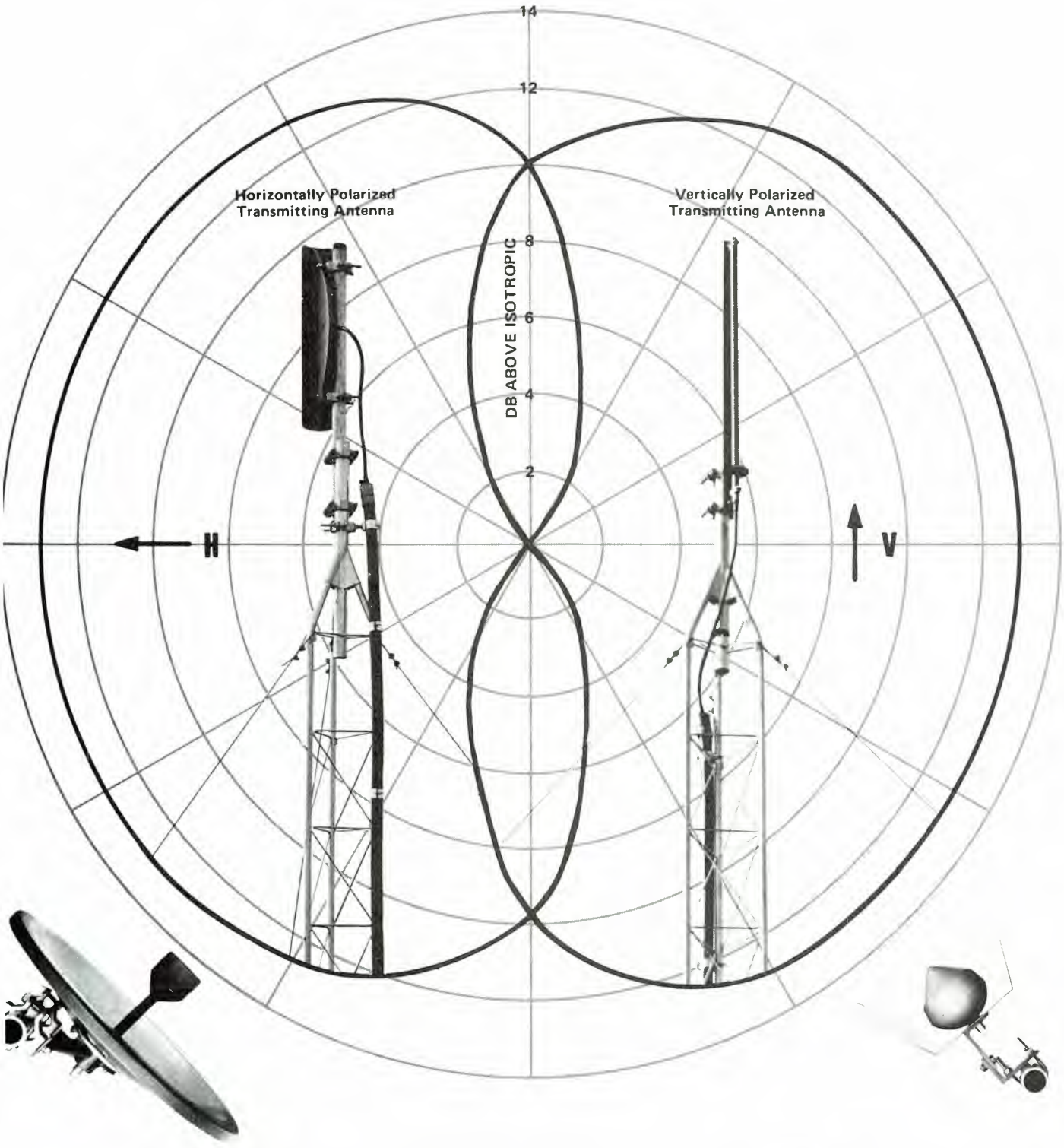
"And, finally, I want to tell you that the Commission, over the next three years, will undertake a vigorous campaign to rid your industry of some undesirable and unsavory business practices and, perhaps, some undesirable and unsavory licensees. Ladies and gentlemen, the day is over when you can engage in fraudulent billing practices, rigged contests, hoax announcements, misrepresentations to the Commission, unauthorized transfers of ownership or control and a number of other very shoddy actions and expect to retain—without jeopardy—your license to operate. Precisely because I **am** an avowed believer in our free enterprise system and in licensee discretion, I intend to crack down and crack down hard on those few—and I truly believe it to be a few—irresponsible broadcasters who simply cannot conform to a decent code of professional conduct. Every honest member of your industry suffers as a result of their conduct and every member of the public is the poorer for their excesses. In summary, let me assure you that I am just enough of a moralist and an activist to see to it that fraud doesn't pay.

"The necessity for what may be harsh governmental action relative to a limited number of licensees in these areas portends, however, a message of a far greater significance to the industry as a whole. And here is the message: for every failure or inaction on the part of broadcasting to meet a well demonstrated public need, there will be a demand and, indeed, a requirement for government to take corrective action. In each instance, along the remedial continuum, there is a wide range of regulatory alternatives, many of which I might find personally undesirable and almost unacceptable from the standpoint of my philosophy of the appropriate function of government.

"What I am calling for, ladies and gentlemen, is a New Ethic in broadcasting—a New Ethic which fully accepts the opportunity to serve as a public trustee and all that it may entail; a New Ethic which rejects the concept of engaging in a fraudulent practice simply because you probably won't get caught; a New Ethic which refuses the extra dollar when the cost is to the public; a New Ethic which reflects a rededication to principle, a rededication to excellence, a rededication to decency, a rededication—indeed—to the public service.

"The answer to excessive violence

This exhibit hall shot was taken from the second level during one of the lulls in the action. At other times the traffic was quite heavy.



FIRST IN MDS ANTENNA SYSTEMS

Andrew is first to offer a complete and proven line of antenna system equipment for the new Multipoint Distribution Service (MDS). We introduced our line of MDS antennas at the first Common Carrier Association for Telecommunications Convention in July, 1972, and are now first to have equipment in service in an actual operating system.

First "on-the-air" MDS station, WOI93 in Washington, D.C., uses two orthogonally polarized Andrew antennas with cardioid patterns, as illustrated. This arrangement provides omni-directional coverage and eliminates blockage of a nearby building.

We are now in a position to ship complete MDS transmitting and receiving antenna systems from stock. For further information, ask your Andrew sales engineer or write for Bulletin 1052B.

ANDREW

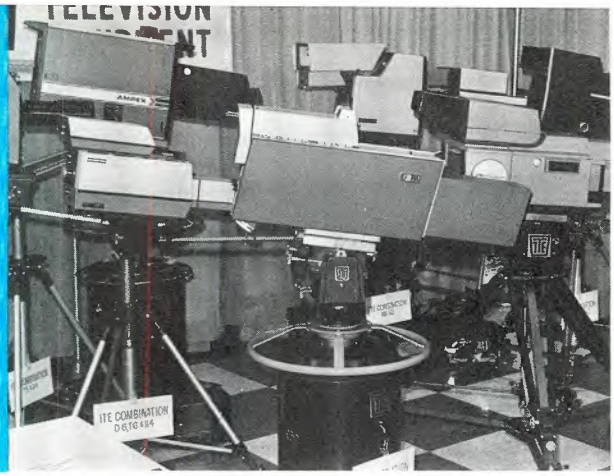
ANDREW CORPORATION
500 W. 153rd Street
Park Forest, Ill., U.S.A. 60462

ANDREW ANTENNA COMPANY LTD.
606 Beech Street
Whitby, Ontario, Canada L1N 5S2

ANDREW ANTENNA SYSTEMS
Lochgelly, Fife
Great Britain KY5 9HG

ANDREW ANTENNAS
171 Henty Street
Reservoir, Victoria, Australia 3073

For More Details Circle (29) on Reply Card



There was the typical hard choices to make in TV cameras. But it was complicated this time by the portable cameras (covered in another section of this issue) that pave the way for electronic journalism.
(Photo by Donna Roizen)

and indecency on television lies not so much in government but in you. The answer to quality children's programming, and fair and tasteful advertising, lies not so much in the government but in you. The answer to balance and objectivity in news and public affairs presentations lies not so much in government but in you. And—in the final analysis—the answer to equality of opportunity and the need to bring our minority populations into the mainstream of broadcasting life lies not so much in government but in you.

"While the government **must** act where the public interest is ignored, I am convinced that answers to these issues and others will be forthcoming from the private sector. I am convinced that a New Ethic in broadcasting—and perhaps in business life in general—**can** happen. And I am convinced that, together, we can bring a new era to this wonderful industry and to a very deserving American public."

TIO Director Urges Action

The television industry can expect more criticism from more sources and more formidable opponents in the years ahead, Roy Danish, Director of the Television Information Office, told the convention.

To respond to this criticism, Danish said, broadcasters must come to a deeper realization of the fact that the viewing public actually is solidly in favor of today's television fare and that broadcasters will find strong allies when they take their case to the public in a forthright and positive manner.

"Because of a number of societal factors which have little to do with television's performance in itself, the potential for criticism and activism will increase geometrically," Danish said. He cited five reasons:

"1. The growth of minorities as a factor in American life—both in the proportion of minority population in major cities, and in the awareness of ethnic and religious foundations for solidarity.

"2. The growing level of education throughout the American community—with its consequent stress on diversity, on new kinds of programming and new kinds of moral and political values. We can easily predict that the student fresh from courses in Marcuse and Mailer will not be immediately comfortable with the escape programming that has given pleasure to his parents.

"3. The current pervasive cynicism evident in public opinion polls. Distrust of politicians, first on the list, but also distrust of big business, big government, institutions in general.

"4. We are dealing on a national level and locally, too, with groups who have become very sophisticated in the use of the law and of FCC regulations. They've learned the power of petitions to deny and of pressure tactics generally.

"5. Your Congressman might become another reason to move cautiously toward our industry's future. Right now, he's probably playing it pretty close to his chest, waiting to see how the wind blows on impeachment and related matters. But I think he's eventually going to be brought to one inescapable conclusion that might affect broadcasting—in the post-Watergate climate, it just might be that institutions become fair game. Recent studies from the Roper people, published this month, show that big business and big government are tied for second place as 'the most dangerous threats to society.' Only Communism topped them in the minds of the public we serve."

"I, like you, deplore these potentials for trouble. But I see them as manageable; I see them as opportunities, in fact, for better industry/community relations for the industry," Mr. Danish told the broadcasters. "For all these many possible issues and these many possible critics can be set against two resources that broadcasters have not yet tapped to the full: those resources are the proved good will of the majority of viewers, and the remarkable record of achievement which we have compiled over the past couple of decades."

The TIO Director pointed to "the dangerous gap between the fact of wide public acceptance of television and the possibility for strong and vocal support from this public against the growing number of critics we are going to face.

"Most of our problems can be traced to a gap that we collectively are responsible for," he said. "That's how our system works: when the public is uninformed about all sides of a particular issue, our critics move into the vacuum. Sometimes with accusations. Sometimes with schemes to take over."

Daniel indicated how TIO can help close that gap: "Money may be tight, critics seem vengeful; your staff is busy with its day-to-day work. Enter TIO. We produce the spots, the slide presentations, the art and copy for print campaigns, the suggested letters and station editorials for on-the-air use. We commission the public opinion surveys, the issue research papers and speechs, the **Teachers Guides to Television.** We send our troops out to luncheon clubs, interview shows, universities, non-industry conventions."

"Does all this activity yield results?" Danish asked. The proof comes in widely scattered bits of evidence. Letters in response to our national ads; citations of our research by columnists, government

officials, educators and even our bitterest critics—even they cannot ignore the statistics. Requests for information from the FCC and from college students, from station personnel and from community action groups. These examples, too, will be familiar to many of you. But what I believe to be our greatest area of achievement is, by its nature, the most difficult to document—and that is our cumulative effect on the climate of public opinion. Those who use TIO materials and similar promotional tools have seen this effect in the form of positive response from viewers. How do you calculate that kind of response? You don't. But I'm sure that each one of you has a "feel" for it, or you wouldn't be in broadcasting. Test that "feel" on an issue or two. I think you'll be gratified by the results."

Danish gave specific details, as illustrations of a general approach, how TIO materials can aid stations on two issues—violence on the air and pay cable siphoning. In using such materials, he said, "you'll be better prepared to meet the challenge which will definitely be presented by those better-educated, more articulate, more self-confident and more highly-motivated (and possibly more suspicious and cynical) critics I spoke of at the beginning of this talk.

"I've set a full table for you this morning. And there may be more on it than you can manage. But do pick what you can digest. And plan to do more as you go along.

"TIO will be doing its best at the national level with research and advertising and publications, working with national groups, and writers, educators, clergymen and labor leaders. With the cooperation of our sponsor stations, we're sending our publications to local leaders, too. Your mayor and Congressmen and Senators are on our mailing lists. We will, of course, be giving you the materials to work with in your communities. So, let us help you. And urge your staff to carry the ball.

"The decision to move ahead wholeheartedly can only be made by you. A system, a business, an important kind of freedom is at stake in America. For the sake of that freedom, I hope you choose to speak up."

Former Commissioners Disagree....Again

Four former Federal Communications Commissioners largely split their "votes" on major broadcasting issues, during a mock FCC meeting.

The ex-commissioners participated in a discussion of the prime-time access rule, license renewal, equal time and children's television during the final session of the Broadcast Education Association's 20th annual convention.

Kenneth A. Cox, E. William Henry, Lee Loevinger and Robert

(Continued on page 54)

High Precision Rebuilding—

BROADCAST Econco SERVICE, INC.

Econco Broadcast Service Inc., the largest power tube rebuilding factory in the United States, can save you approximately one-half the cost of a new power tube simply by rebuilding your used tube! Manufacturers, in making new tubes, must pay the high cost of rare and expensive metals. In rebuilding used tubes, Econco reuses most of the original parts, thereby saving you money.

Here's how it works...send your used tubes to Econco: Upon receipt Econco will perform tests to determine whether tube is in rebuildable condition. If acceptable, your tube is processed through several rebuilding steps (some of which are shown on these pages) and shipped back to you. By having your used power tubes rebuilt you can realize a second, third or fourth life from them. Before shipping, Econco tests all rebuilt tubes to original manufacturer's specifications, thereby providing you with low cost, reliable tubes that are equal in every respect to those tubes available from any manufacturer.

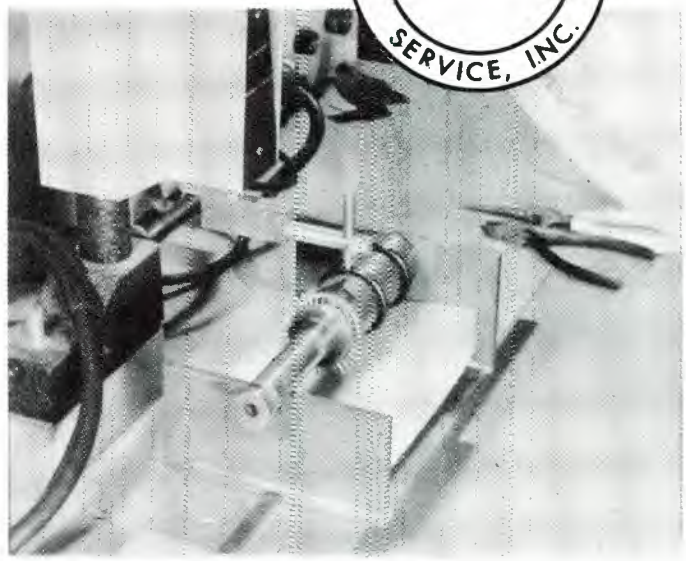
Econco buys used tubes

Econco will buy your used tubes even if you do not intend to use our rebuilding service. Econco will pay a minimum of $10.00 per tube (depending on acceptability, size, cost) plus all shipping costs. Econco's rebuilding prices are based upon receipt of an acceptable tube. Econco buys all used tubes that are listed on the rebuilding price list, so you may contact the factory to check the availability of a needed tube even when you do not have a trade-in tube. Add 20% to rebuilding price list for no trade-in tube. No authorization is needed to ship tubes for rebuilding or sale to Econco.

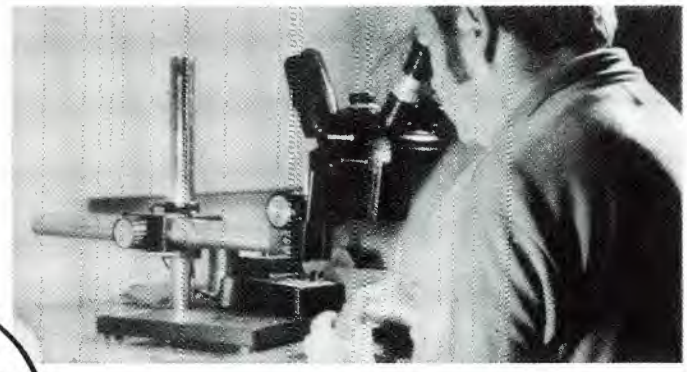
The Price Is Right

Emergency tube stock

Econco maintains a 24 hour answering service for emergency tube delivery. Econco also maintains a stock of popular tubes such as the 5762, 4CX5000A, 4CX10, 000D, etc. so that emergency tube delivery can be accomplished in as little as 24 hours to your nearest airport, and Econco will pay the freight!



Grid Making
A 3CX2500 grid being spotwelded on a mandrel



Inspection
A finished grid assembly being inspected

Filament Mounting
3CX2500 Base assembly getting new filaments spotwelded in

ECONCO BROADCAST SERVICE, INC.

Rt. 2, Box 188
1302 Commerce Ave.
Woodland, Calif. 95695
(916) 662-6031

For More Details Circle (30) on Reply Card

Ultra Audio Products

Ultra Audio Pixtec

"Picture Techniques"

***NEW* YEAR:** we expect 100% sales increase, thanks to your acceptance of UAP

***NEW* NAME:** added to show our dedication to video

***NEW* LINE:** things everybody needs, nobody else thought to make

***NEW* MARK:** UAP = Ultra Audio Products & Ultra Audio Pixtec

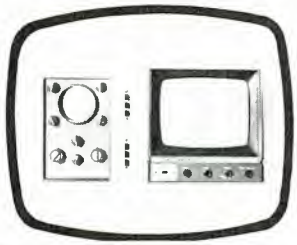
***NEW* GIRL:** introducing "Superboots '74"

***OLD* RELIABILITY:** broadcast-type products at industrial-user prices, such as . . .

Here Now

WM-3 WaveForMonitor™

PC-9 PulseCross Monitor



WP-39 WFM & PCM. rackmounted

R-1 AutoWinder™

AI/O-12 Audio Interfaces

Coming

Broadcast-grade R-G-B CHROMA KEYER designed by the inventor of chroma key.

PK-32

Low-cost TITLER & PROMPTER with CRAWL. Remote-controlled vari-speed available.

TP-1

Broadcast-grade NTSC VECTORSCOPE at less than half what you'd expect to pay.

V-3

High-speed AUTOWINDER™ moves up to 4800' of ½", 1", 2" tapes in either direction. Automatically stops at preselected point. Eliminates video head & tape wear.

R-2

Ultra Audio Pixtec

P.O. Box 921 · Beverly Hills · California
90213 U.S.A. · Telephone (213) 849-1433

DIV. OF AUDIO INTERNATIONAL, INC. distributed through dealers by TELAUDIO CENTRE.

Ultra Audio Pixtec

For More Details Circle (31) on Reply Card

Electronic journalism steals the show

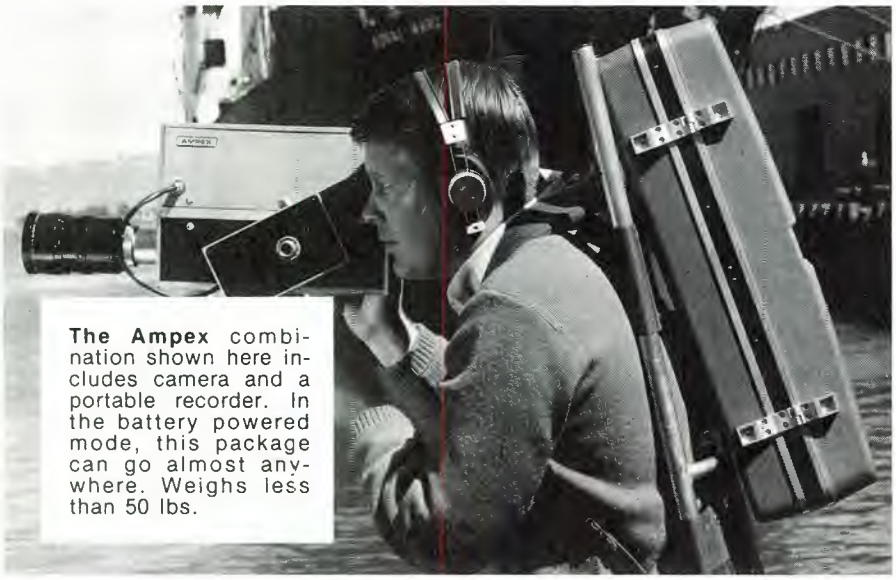
By Joe Roizen*

*Video consultant to BE. Donna and Joe Roizen operate as world-wide consultants under the name of Telegen.

Can an Eastern Texas town find happiness hosting an NAB convention, or vice versa? Now, after the fact, the answer is a resounding yes. Notwithstanding the undercurrent of concern about Houstons' geographical displacement, attendance on the part of both delegates and exhibitors was good, and the Nixon visit heightened general interest. Gone were the crowded corridors of the Chicago Hilton or the scattered exhibits of Sheraton Park and Shoreham. Instead there was a large new exhibit hall with wide aisles, high ceilings, adequate space, well designed displays, and good circulation. About the only complaint was non-proximity of many of the hotels and hospitality suites, but frequent shuttle buses and a little walking took care of that.

The 74 NAB was the site for some new philosophical and technological battle lines being drawn in the constant struggle to affect or serve this industry. Minority groups such as women or blacks continued to express displeasure with the lack of adequate representation or influence in this predominately male, mostly white management sector of one of the nations most important multibillion dollar industries. On the technical side, the visiting station manager or chief engineer was confronted with a gamut of equipment choices never before available. Wading through the claims and counter claims of the competing vendors was an exercise in sophisticated frustration.

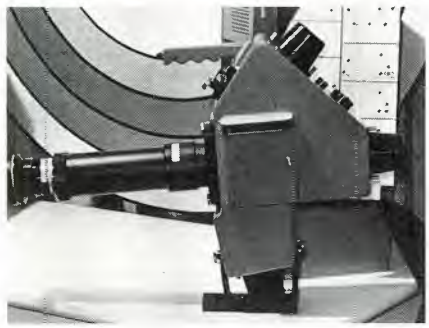
Four major trends seem to be developing rapidly in the broadcast equipment field, and these captured the attention of most engineering oriented visitors.



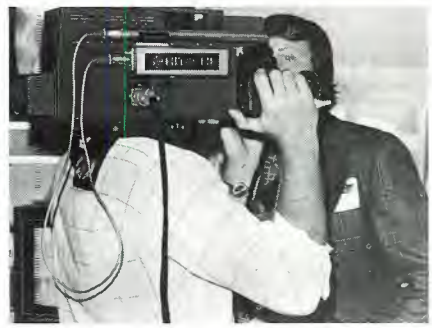
The Ampex combination shown here includes camera and a portable recorder. In the battery powered mode, this package can go almost anywhere. Weighs less than 50 lbs.

As with most of the new portable cameras, the Asaca camera can be mounted on a tripod.

The Bosch version also includes a backpack.



This Editel type portable was used at the last Olympiad.



The Hitachi camera borne atop the shoulder is now in use at NHK, the national network of Japan.

ANTENNA MONITORING WITH A COMPLETE

FCC TYPE APPROVAL NUMBER 3-218

TRUE DIGITAL SYSTEM

The DAM-1 is a true digital antenna monitor designed specifically for measuring the parameters of broadcast frequency directional antenna systems. Digital data is not obtained by adding an A/D converter to the output of conventional analog circuitry; instead, the latest digital techniques and TTL components are applied to achieve a truly digital approach to phase and current ratio measurements. Data is displayed on front panel seven-segment digital readouts to minimize reading error. A simplified selection system reduces operation of the DAM-1 to a straightforward procedure.

- A true digital antenna monitor specifically designed for broadcast directional antenna systems.
- Complies with FCC monitor and remote reading specifications. DAM-1 has received FCC Type Approved Number 3-218.

TWO WIRE TRANSMISSION REMOTE CONTROL UNITS DAML-1/DAMR-1

The DAML-1 and DAMR-1 provide for long distance remote control and readout of the DAM-1. Digital data is transmitted in both directions by integral FSK modems at 300 BPS.

HARDWIRE REMOTE CONTROL UNIT DAMH-1

The DAMH-1 provides for remote control and readout of the DAM-1 at distances to 1,000 feet.

TWELVE TOWER EXTENSION UNIT DAMX-1

The DAMX-1 permits the DAM-1 to be used for directional antenna systems with up to 12 towers.

TOROIDAL CURRENT TRANSFORMERS TCT

The TCT-1 and TCT-2 are precision toroidal current transformers to provide RF sampling voltages for the DAM-1 or other metering applications.

COMBINED DIGITAL TRANSMITTER REMOTE CONTROL AND MONITORING SYSTEM TMCS-1

The TMCS-1 provides full transmitter control and digital antenna monitoring. Includes integral FSK modems.

DELTA ELECTRONICS

5534 PORT ROYAL ROAD
SPRINGFIELD, VIRGINIA 22151
TELEPHONE: 703/321-9845
TWX: 710-831-0620

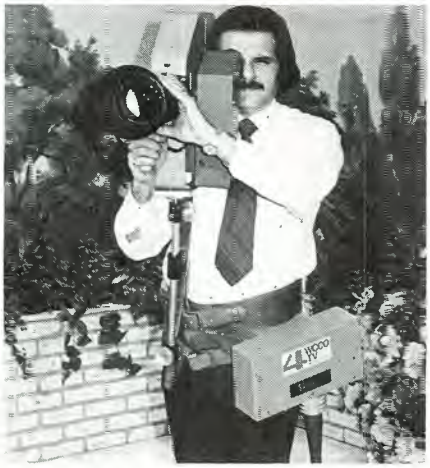
For More Details Circle (32) on Reply Card

The Ikegami camera has been used by CBS in their experiments with electronic journalism.

RCA's unique entry has a miniature viewfinder. Note the far-forward mainstructure positioning.

TeleAlpha's package includes the Akai camera and a modified cassette VTR. A separate edit console is included.

Commercial Electronics' entry is another "go anywhere" camera.



Portable cameras were so hot, some sold right on the exhibit floor. This Philips unit already has the station call sign on it.

Here's the machine that has everyone guessing. It's the IVC 9000 two-inch broadcast quality helical VTR from International Video Corp.

Electronic Journalism

The first is Electronic Journalism, a catch-all phrase that relates to more portability and greater speed and mobility in gathering the daily local news and getting it on the air. Highly publicized experiments such as the CBS venture spearheaded by Joe Flaherty and his headquarters group has driven a number of suppliers to rapidly bring to market lightweight, lower priced color cameras that can be shouldered by one person and carried out into the action. The range of size, price and ultimate quality was great, the industry leaders like RCA, Philips and Fernseh have full broadcast quality models that rival or exceed full studio camera specs.

CEI's unit has some unique features such as a separable view finder that permits using the camera head around corners or at low angles.

The Ikegami unit has been extensively field tested by CBS and the Asaca has a few production houses that use it for commercial spots.

The Editel unit has been widely used on sports events and other remote locations.

Still further on the scale are the Akai, Magnavox and TelAlpha units which achieve lightness through less pick-up tubes and simpler electronics. They also have lower performance characteristics, but are touted as equalling minimal standards for on the spot news coverage.

Coupled with these portable color cameras is the need for small VTR's that compliment them, and there were a number of schemes on display that used combinations of reel-to-reel and cassette units which depended on digital time-base correctors to restore the output signals to meet on the air FCC requirements.

Quad vs. Helical

The second major confrontation at the Houston NAB, was the War of VTR's. There have been a few light skirmishes between the **Quad Quadrille** and the **Slant Track Sluggers** in London, Montreux and New York, where prototypes of various machines, such as the IVC

Meet The Family

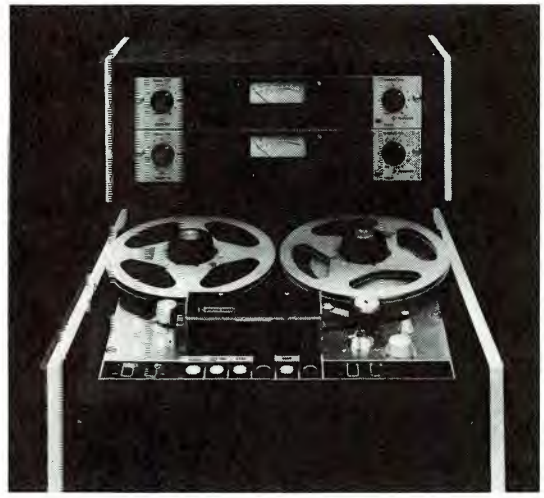
Swiss Performance

Electro Sound's new ES-505 series recorder/reproducers have a heritage of classic design and precision performance. They've been engineered specifically for broadcasters, recording studios, and other professional users.

European or American—no other machine has more significant "Operator Engineered" features. Disappearing headgate, built-in audio oscillator, optical motion sensing, continuous bias monitor, differential disc brakes, optional edit third reel, fully lighted controls and much more .

The ES-505 is available in ¼" or ½" versions, with one, two or four channels of electronics in console, portable or unmounted configurations.

Performance specs—we match or beat the best! And at American prices.



The ES-505

The ES-6000

We Repeat

Electro Sound builds professional, high speed audio tape duplicating systems. The ES-6000 is our 240 ips version. Long lasting, versatile hardware.

We're noted for sophisticated state-of-the-art designs that produce a finished tape of unquestioned high quality. That's what pays off in operating profits for our customers.

And Electro Sound is the only single source for duplicators, loading racks, QC reproducers, mastering devices, cartridge and cassette winders and splicers.

Whether you duplicate retail music, broadcast syndications, or "spoken word" cassettes, we have a system for you. After all, the giants who pioneered the pre-recorded tape industry, as well as those just joining it, are using Electro Sound systems in 30 countries.

ELECTRO SOUND®

ELECTRO SOUND, INC.
725 Kifer Road, Sunnyvale, CA 94086
(408) 245-6600 Telex: 34-6324 LECTROSND SUVL

International Distribution By:
AUDIOMATIC CORPORATION
1290 Avenue of the Americas, New York, NY 10019
(212) 582-4870. Cable: AUDIOMATIC. Telex: 12-6419
European Office and Showroom
4, rue Ficatier, 92400 Courbevoie, France (Paris).
333.30.90. Cable: AUDIOMATIC. Telex: 62282

For More Details Circle (33) on Reply Card

9000 and the Fernseh/Philips BCR 50 were shown. This time a full scale battle is in progress with transverse recording proponents proposing new formats that claim to undercut the advantages advertised by the helical and segmented helical advocates.

Both RCA and Ampex had on display new quad VTR's, that offered smaller size, lighter weight, lower cost and new operational flexibility if certain specifications were accepted.

The Ampex AVR-2 (prices range from 69K to 92K, depending on options), is neatly packaged in modular form that makes it transportable by two strong men. Maintenance is enhanced by a "spring up" top plate and easy board access. While it does not have some of the AVR-1 features like vacuum columns and instant start, it does offer half-speed for tape economy and two audio tracks for stereo or dual language operation. The price is lower, but so are the specs. The message is that if the broadcaster wants maximum quality for program origination, then the quad at 15 ips is the only way.

It's about the same at the RCA booth. They do have a new model called the TR-600, which also accomodates 7.5 ips, tape speed and provides color signals at a lower price (70.5K), but if you want all the bells and whistles, it gets back up to the high rent district in a hurry. RCA's TPR-10 is also a portable unit for special applications that parallels the Ampex VR3000.

To give the quads a run for their money, IVC had on hand three production units of their new 9000 segmented scan helical recorder using two-inch tape. This machine offers excellent specs, while having inherently lower aquisistion and operational costs when compared to the quad recorders they are intended to compete with. Tape speed is eight ips, head warranty is 1500 hours, and full spec video and dual audio tracks are normal. With all the color correctors the machine is in the 80K bracket.

The potential of a low cost helical recorder replacing the quad machines for high quality origination doesn't seem to be around the corner, and the only pot of gold at the end of the band of chromatic water vapor, is in the coffers of the big VTR manufacturers.

Equipment Modifications

The third aspect of equipment development, is in the realm of making do with present quads through modification, updating or utilization in manners not promoted by the original manufacturers. Several smaller companies offer some interesting alternatives to rushing out and buying all the gleamingly new expensive VTR's. Foremost in this area is Recortec, who offer kits to modify the quad recorders into constant tension transports, after which a programming controller can be used to provide cart type consecutive or alternative spot selection for commercial inserts, or station breaks. The combination uses VTR's the station already owns. A different philosophy of operation is involved since the program material must be assembled on the A and B reels of the two programmed quads. However, it is claimed that this is no more difficult than the cart machines need for program transfer to the cart format. Recortec also offers other add-on's to quad recorders, such as an LED digital tape time reader, which can be installed on any used machine.

Unveiled at the show was the Ampex modular AVR-2 VTR. It can be quickly dismantled and carried out to a remote site. It weighs about 600 lbs.

Since reduction of head and tape cost on quad machines is now under such careful scrutiny by Ampex, RCA and IVC (if one is to believe all the ballyhoo about Quad-2 and the 9000), the peripheral suppliers have some different answers in that area. Videomax supplies a head refurbishing service for quadruplex heads that claim a 500 hour factory warranty,

The RCA compact machine version introduced at NAB provides one-second lockup for stabilized color. It weighs in near 700 lbs.

roughly three times that of RCA and Ampex, although still only a third of the IVC 9000. However, if you already own quads, this could be a substantial reduction in head rework expenditures. To save on tape, both Magnatek and Recortec offer devices to clean, recondition and evaluate tape so as to get the maximum useage out of this expensive consumable. These machines also reduce wear and tear on the quad machines by performing the functions of spooling, audio monitoring, address code record/read and quality evaluation on a relatively small, mediam-priced device rather than the full blown VTR.

For the quad owner who wants to add sophisticated editing facilities using the SMPTE time and address code, there are quite a few suppliers starting with a minimal package by Datatron of a code generator, reader and manually selected controller (model 5350), at less than 7K to computer controlled on line quad systems like the CMX System/300. In between is a seemingly endless variety of electronic editors at various price and complexity levels offered by Ampex, CDL, CMX, Datatron, EECO, RCA, TRI and others.

Time-Base Correctors

The fourth trend in equipment, that was very noticeable because of the sudden emphasis on this technology by at least seven manufacturers was in the area of stand alone digital time-base correctors for video tape recorders. It seems as though everyone has zeroed in on the one common deficiency of all rotating head VTR's, the distortion of the time domain by the eccentricities of segmented or single field scanning. The variable delay line techniques used up to now have too small a corrective window for most helical machines and all the heterodyne schemes break up the video signals into band limited luminance and chrominance components.

The new approach is to convert the analogue signal into digital form for time positioning, then convert back to analogue form for processing and output. The result is a window in the horizontal line time rather than microsecond range which accommodates and corrects the perturbations of even the grossest protable helical recorders.

In theory then it is possible to originate program material on very small, inexpensive recorders, then put the playback signal through a digital "black box" and put it on air or transfer to a quad for insertion into an edited program. Several companies at the show were displaying and proposing just such combinations, (CVS, TelAlpha, Akai, etc.). However, time-base correction alone does not make a good video signal out of a bad image, it just eliminates the geometric eccentricities (jitter, hooking, flagging, skewing etc.), and diminishes the phase distortions. It does not make up for limited bandwidth, poor S/N, mistracking, or poor colorimetery. □

Exorcising system noise

By Dennis Ciapura

System noise is probably the most difficult devil to exorcise from complex broadcast systems. While there may be a few broadcast engineers who have successfully employed incantations and rituals to free their audio gear from excessive residual noise, most of us must rely on more conventional albeit less mystically appealing techniques.

It is usually quite easy to keep system response and distortion figures well within contemporary broadcast standards and far better than minimum FCC requirements, but the residual noise level is seldom as impressive. Although the newer audio components are cleaner than their ancestors, modern radio and TV facilities have grown in complexity so that commulative noise at the end of the chain continues to be a problem.

Part of the problem can be in the method of measurement employed even if the gear itself is clean. So, before looking at some of the noise exorcism techniques that can be invoked, let's be sure of what we are measuring.

Most of the measurement problems arise at the connection of the test equipment to the audio chain under test. Very often a method that seems quite satisfactory, as evidenced by rather low distortion readings, deceives the engineer into thinking that his noise data is also valid. Consider that a system can have only a 50 dB S/N ratio and still exhibit distortion figures of less than 1 percent at normal levels; 1 percent being only -40 dB. Most modern broadcast equipment is so linear, in fact, that noise whether real or test method induced is most of what the distortion meter reads.

The classic example of a flakey test set-up is shown in Figure 1. As you can see, one side of the line has been grounded by the test equipment connection! **Many distortion meters have "floating input" terminals which usually eliminate the problem, but not if the scope is left connected across the line.** Most distortion meters have scope output terminals and they should be used. If your measuring equipment does not have a floating ground, an isolation transformer will have to be used. A note of caution here: be sure to load the secondary of the transformer with a resistor equal to its rated impedance. The distributed capacitance of even a moderately high impedance winding when left loaded by only the high impedance input of the test gear can cause the high end of the band to be rolled off.

For our noise measurements to be valid, they must be made on equipment that is flat over the specified range. For broadcast purposes the bandwidth of noise measurements should be at least 15 kHz, although wider bandpasses can be useful in picking up oscillations. Even low level oscillations can cause annoying hetrodyne beats, particularly in FM stereo equipment.

When the noise measurements are made at the modulation monitor output, an unbalanced output with one terminal already grounded is usually available. Listen to the output of the modulation monitor with no modulation before starting though. "Birdies" are sometimes present which can blur the real noise level. A frequency monitor connected to the same RF sample line as the modulation monitor is a frequent offender. If, however, the noise only stops when the input leads are removed from the stereo generator, there is an oscillation in the audio chain which must be removed before accurate noise data can be obtained.

When using a distortion meter to make the noise measurements, be sure to switch to the voltmeter section so that the notch filter is out of the circuit. Switching the instrument back to the distortion measuring mode after the noise measurement has been made, how-

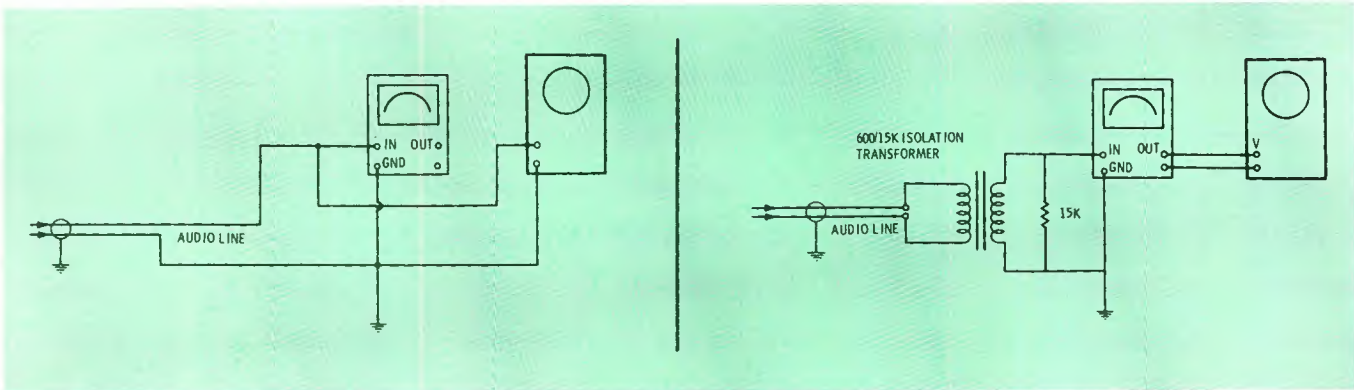


Fig. 1a Test gear that does not have both input terminals above ground can ground out one side of the audio line, causing hum to be developed across the loop.

Fig. 1b Correct method of connection preserves integrity of ground isolation.

ever, can provide a useful method of identifying the noise source. Simply tune around until a minimum indication is obtained. A scope can also be employed to assist in the witch hunt. Whenever possible the test equipment chassis ground should be connected to the main station ground. Plug reversing (AC) can also help minimize test equipment hum due to ground loops.

It is often very helpful to know the frequency of the main noise components and thereby gain some clue to their point of origin. Most broadcast facilities have noise outputs containing a mixture of "white noise" 60 Hz power supply hum, 120 Hz power supply ripple and sometimes 15.75 kHz, if the facility is a TV station or an FM in very close proximity to a TV rig.

Stereo generators usually contain 15 kHz low pass filters to keep main channel audio out of the pilot and subcarrier generation circuits, but these sometimes take a kHz to get rolling. Stereo stations with SCA have "birdie" possibilities all their own, of course. It is important to remember that the system output may (and usually does) contain a combination of the above—a pretty scope trace indeed. Figure 2 illustrates some of the more usual noise pictures.

Limiting Offenders

Not much can be done to improve the basic S/N ratio of the audio equipment in the chain, but it's imperative that each piece be used to its best advantage if maximum performance is to be obtained. A line amplifier that is operated at 30 dB below its maximum output level is not yielding the S/N ratio that it is capable of!

Modern broadcast and recording equipment usually contains high open loop gain circuitry with heavy negative feedback which results in a distortion curve that is almost flat up to the clipping threshold. Although peaks must be allowed for, 10 to 15 dB is normally adequate. To operate at a lower level will not

The author (r.) discusses results of routine noise tests with operation director Jack Lee.

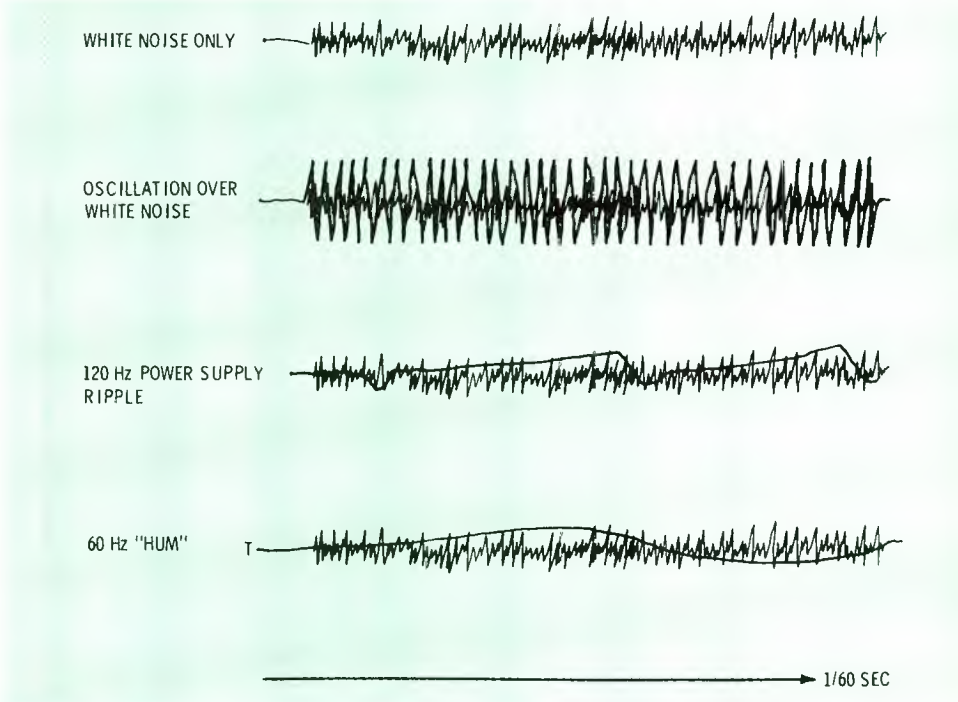


Fig. 2 Typical system noise outputs are shown graphically for clarity. A combination of these noises can be difficult to interpret. A high gain audio amplifier is sometimes a useful tool in identifying the type of noise so that its source may be found.

Management Highlights

Who knows how far system sound and noise go into capturing or losing listeners? We can't be certain just how far a clean or noisy signal can penetrate the ratings. But it will have an effect. And that effect will be felt, if not heard, by your listeners. Of course, listeners includes your advertisers.

Admittedly, there are golden ears, and then their are ears like mine that are not close to golden. If pride were not enough, think on the receiving equipment in use today and add a number of advertisers and would-be advertisers listening and you have a fine case for exorcising noise. But as the author points out wishing will neither drive noise out nor improve profits.

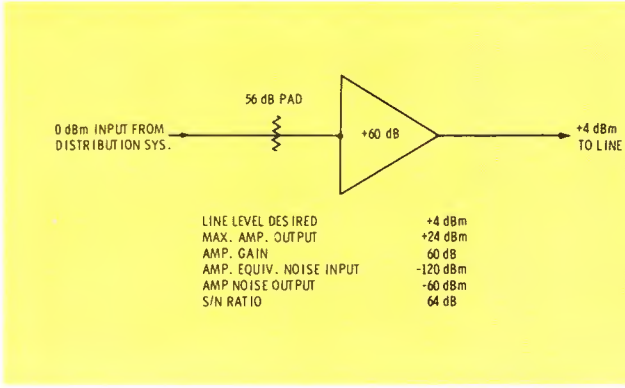


Fig. 3a A common but less than optimum method of setting levels. In this example, the line amplifier's overload to noise characteristics are not being used to their best advantage.

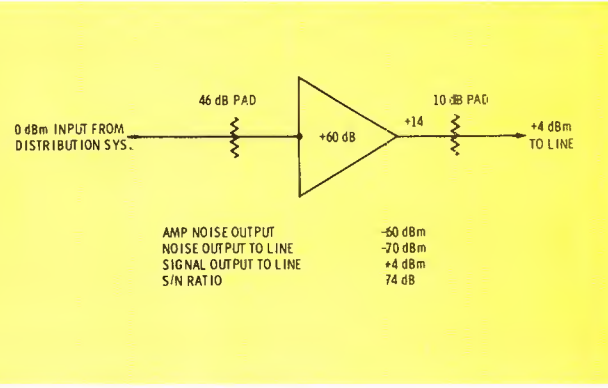


Fig. 3b The addition of one pad as in this example will result in a 10 dB increase in the S/N ratio. Note that 10 dB of headroom remains.

significantly reduce distortion, if the equipment is operating properly, but it will degrade the S/N ratio.

Figure 3 shows a line amplifier to drive a Telco loop. Both A and B of Figure 3 provide the same drive to the line, but as you can see, B yields a full 10 dB increase in S/N ratio going into the line.

When and where to pad are important considerations: the cummulative effect of "guesstamation" levels on the noise performance of the overall system can be devastating. Consoles have VU meters adjusted to give the user the best S/N consistant with adequate overload resistance, and are therefore the easiest part of the system to set up, if properly operated and maintained. Limiters can be offenders despite their constant output characteristics if not properly utilized. A limiter can be used to improve the S/N ratio by minimizing the amount of head-room required in all portions of the chain after the limiter.

Figure 4 shows a limiter employed as a line driver rather than a line amp. Note that an additional 6 dB can be added to the S/N ratio with this arrangement. We don't mean to imply that lines should always be driven by limiters. A limiter at any point in the chain ahead of the lines would yield the same result, but this simple example is easy to compare with the one in Figure 3. At any rate, it is easy to see why system levels must be engineered and not approximated. If the input level to the limiter is too high the noise from the console output will be brought up closer to the threshold of limiting. A 6 dB high input will effectively cancel the additional S/N ratio that has just been gained. In its place will come

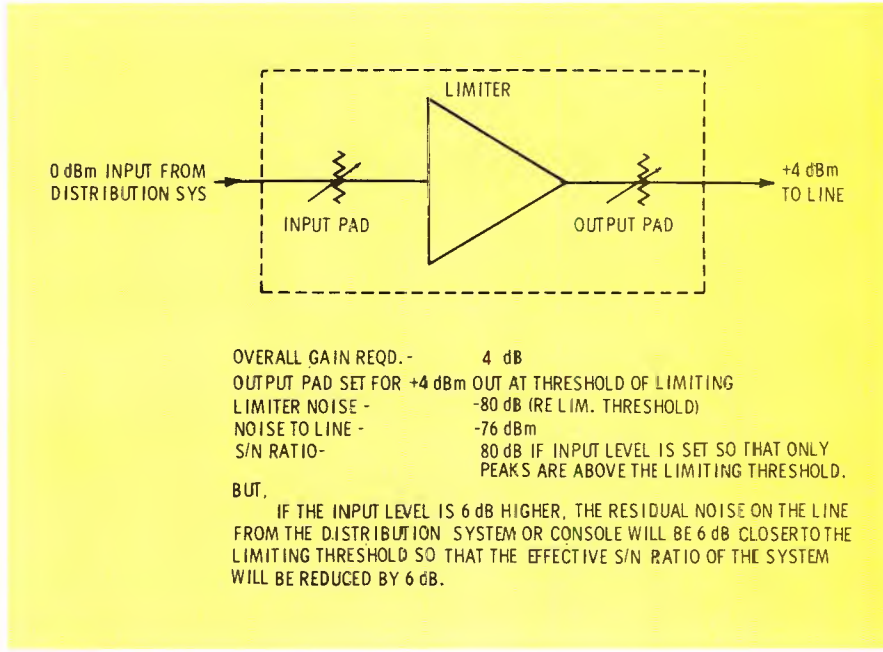


Fig. 4 In this case a limiter is used to drive the line. This scheme prevents overloading any repeater in the line, allowing the signal to run at normal level on the line, even if sudden peaks in the program material have been a problem. The need for excessive headroom has been eliminated, but noise in the output circuit will be swapped for noise from the input circuit, if the limiter input pad is set too high.

Dennis Ciapura poses with typical noise exorcism gear.

6 dB of signal compression. A similar effect is produced by AGC amplifiers, except that the release time constants are slower, which means that the noise becomes apparent during program segments which are low.

Measured vs. Effective Signal-To-Noise

At this point we must distinguish between the measured S/N ratio of a broadcast audio system and the effective or dynamic S/N ratio. When the audio proof is made, all AGC circuits are disabled, as per Part 73. From a practical standpoint, frequency response measurements must be made this way, but an additional S/N test with the gain control circuits active can be very interesting. After all, we normally broadcast with the AGC in action and that is what the listener hears.

The theory that a little leveling here and a little leveling there won't hurt can have some astonishing results when the "heres" and "theres" become additive. As an example, if the audio output level from a TV film chain is too high, the first AGC amplifier on the line will bring the hum and noise from the film chain up to a very audible level at every program pause. The newer gated gain devices which return to normal gain during program pauses are very useful, but they cannot remove noise pumping already on the line. These devices also must be fed with the proper level: if too low the expansion range will be partially defeated and if too high the expansion will reach down into the noise.

Let's take another look at the hot audio from the film chain. If it leaves the studio with 10 dB of compression and is expanded another 15 dB by the gated AGC at the transmitter during low program segments, the dynamic S/N ratio of the audio chain will be reduced by 25dB! When the residual noise from the film hits this combo, the pumping can be noticeable enough to remind one of sea sickness. This situation is not peculiar to TV of course, and is more widespread than one might expect in view of what can be done with the equipment that is available today.

Some stations apply a band-aid to the problem with a noise gate adjusted to cut the audio below a certain level...kind of a squelchy effect. Proper and judicious use of limiters and gated AGC's along with accurate level adjustments at the signal source can prevent the effective S/N ratio from being so seriously impaired and thus make the band-aids unnecessary.

Most marginal S/N conditions can be significantly improved by taking a second look at how each piece of audio gear in the chain is set and by re-adjusting the levels where possible to use the equipment to its best advantage. If the desired results still cannot be obtained, each individual unit should be checked to see that it meets or exceeds the manufacturer's specs. It is assumed that good shielding and grounding techniques were employed in the original system wiring job. If the audio plumbing looks "tacky", some revamping may be in order if the noise is to be minimized.

If the noise turns out to be in the transmitter, be prepared to deal with the unexpected, like mechanical modulation of the modulated oscillator by the blower and multiple "birdies". A quick check with a good FM stereo tuner can be helpful if there is some doubt as to whether the noise is in the transmitter or the modulation monitor. RF infiltration of the stereo generator or exciter is a common transmitter noise problem. Poor or altered lead dress, shielding and ground connections are frequent causes.

Exit Devilish Noise

System noise demons are often illusive enough to tax the talents of even the best electronic exorcist, but, all noise problems can be solved. A systematic and thorough approach is the best weapon; unless, of course, you are one of the fortunate few with the super anti-noise incantation... □

NAB Management

(Continued from page 41)

Wells analyzed issues presented by BEA. The first three are now Washington-based communications lawyers: Wells is a Kansas broadcaster.

Prime time access stimulated the greatest disagreement, with Loevinger and Wells favoring complete repeal of the current FCC rule which limits network programming to three hours nightly. Cox and Henry, voting as they did during their FCC tenures, called for continuation of the restriction.

"We have now reached the point in our history...that we should forego any notion of letting the FCC have anything to say about program content," Loevinger said.

"Prime-time access was a mistake," he said. "I am against **anything** that lets the FCC have **anything** to say about programming."

Cox suggested that not only should the prime time rule remain in effect, but the FCC should also retreat from its February action in which it partially lifted the restrictions.

Cox characterized the rule's objective as letting local licensees fulfill their programming obligations.

"If there is no way for American TV to generate programming other than to have three networks do it," Cox said, "the Department of Justice may do something to see that competition does develop."

Henry, agreeing with Cox, said he was "amazed at the opposition which the access rule encountered." He said it was intended to "free up the sources of supply, and that is what it's done."

Wells questioned the difference between telling broadcasters what they could or could not put on TV.

Turning to the issue of license renewal, the former commissioners agreed that the current Congressional bill on license renewal would satisfy broadcasters' needs if some changes are made.

Henry disagreed with the House bill's stipulation that broadcasters sit down with citizens' groups to discuss challengers' complaints.

Wells also opposed the citizens' meetings clause, saying that if the Commission chooses licensees wisely in the first place, renewal would face fewer controversies.

Loevinger conceded that the House bill is "better than any others" that had been considered. But he opposed some of its elements. In particular, he cautioned that it could be open to anti-trust law violations.

"If you're really dedicated to public interest, I'd like to see a much stronger bill saying the FCC would license without regard to program percentages," Loevinger said.

Cox, favoring substantial performance standards, endorsed action by FCC which considered past programming.

He said there is a tendency by some challengers to wait until the last minute to pop up with their oppositions. He believed some sort of on-going relationship would be preferable and suggested a "simple form" which challengers would submit to the FCC requesting meetings with station management.

Rating The News

Television news faces an "exceedingly bright" future, William Sheehan, ABC News Senior Vice President, told a convention audience.

"We find a tremendous appetite has developed for television news," Sheehan said. He cited the growth of TV news audiences from 12 million viewers in 1953 to 28 million in 1963, and to the estimated 50 million who watch the three networks evening newscasts today.

In contrast, he said "the print media was once the bulwark of both the news seeker and the advertiser, but revenues couldn't keep up with costs and postage rates, and we lost some great newspapers and magazines."

Sheehan addressed a Broadcast Education Association luncheon at BEA's 20th annual convention. The meeting is being held in conjunction with the 52nd annual convention of the National Association of Broadcasters.

The ABC executive pointed to recent polls which show that TV news "is not only the most important source of information, but also the most believed, the most credible." He emphasized that this situation exists for local news shows as well as network news.

"At stations all over the country, there is a strong feeling that news is a crucial, vital part of the station operation," he said. "The success of the station seems to hinge on the **news** operation.

"ABC researchers have unfolded a pattern," he added. "If a station's local news has a high degree of acceptability and credibility, viewers will hold that station in high regard and this is directly reflected in ratings not just for news, but for other kinds of programming as well."

As more stations recognize this relationship, he said, they are looking for ways to upgrade the image and quality of their local news operations.

Congressional Voice

A panel of four Congressmen urged broadcasters to continue bringing their policy views to the appropriate committees on Capitol Hill. But the House Members stressed that broadcasters—like other special interest groups—should be well prepared before they head for the hills.

The Congressmen appeared before a Joint Radio-TV Assembly at the convention, during a session entitled "How to Win Friends and Work Effectively with Congress."

Panel members were Reps. Lionel Van Deerlin (D-Calif.), Clarence Brown (R-Ohio), Barbara Jordan (D-Tex.) and John McCollister (R-Neb.). Grover C. Cobb, NAB Senior Executive Vice President for Government Relations, was the moderator.

Rep. Van Deerlin, a ranking member of the House Communications Subcommittee, predicted that the House will pass the committee-approved broadcast license renewal bill before the Easter recess next month and send it to the Senate for action.

He praised broadcasters for their "honesty in presenting facts" at the subcommittee's renewal hearings last year. He added, however, that the hearings ran longer than expected because broadcasters centered on what they wanted instead of what they needed.

"Concentrate on your real problems and don't cry wolf," the Congressman said.

(Continued on page 62)

The IC Op Amp Story Part 4

By Walt Jung
BE Solid State Editor

In this final part of our BE IC Op Amp Story we take a look at what is (at least to me, and I hope most of you) a most interesting form of application for IC op amps — their use in audio circuits.

Audio circuits abound in the station or studio, of course, and many of their requirements can be well served by IC op amps. However, there are some snags which can trap you in using IC op amps in audio, so perhaps this article will help you hurdle the traps.

Most of the problems are tied to limitations of IC devices in regard to bandwidth, slew rate, noise, and power output, or combinations of them. I'll be the first to agree that IC op amps do have definite limitations in these areas, speaking generally (1). But, by careful device selection and proper use, these headaches can all be dealt with satisfactorily. What we'll do now is examine a few typical audio signal processing functions and see where these problems come up, and how they can be controlled.

Mic Preamps

One type of circuit which I am frequently asked about are forms of preamps, particularly low noise mic preamps. And people also want to (if possible) eliminate the mic input transformer and its attendant bulk (and naturally, its expense). Let's see a "before and after" example of two mic preamps to examine what this mystery element really does in practice, and when and where it should be used.

Figure 1a is an example of a "transformerless" differential mic preamplifier. This can be easily recognized as an example of the differential amplifier configuration discussed in basic form in Part I (see February **BE**). But, when shooting for low noise operation as an audio preamp, there are other considerations which help squeeze out optimum performance, and they are applied in this case.

For lowest noise, a basically quiet IC should be selected for the amplifier, and the lowest possible source resistance should be seen at each op amp input terminal. Thus a 709 is chosen here for the amplifer, and R1-R3 are set to 1K. Actually, the choice of R1-R3 values is a compromise between low resistance for lowest noise, but a resistance also appreciably higher than 150 Ohms to minimize loading on the mic. Gain is set by R2/R1, and the R2/R1 and R4/R3 ratios should match for best rejection of noise picked up on the mic lines.

This circuit has good noise rejection properties (that is, noise of the hum variety) if precision R's are used, or R4 can be trimmed for best noise rejection. It is a good circuit to use when relatively low gains are needed (40dB or less), such as with high output mics, and lowest self-generated noise is not the prime consideration. When scaled for low gains, it can be very useful, for it will not overload easily as low level mic transformers typically will at high input levels.

The ultimate in noise performance is obtained when a transformer is used prior to the amplifier, as in Figure 1b. In simplified terms, this is advantageous from a noise standpoint because the transformer does not generate noise (whereas the op amp does), but it does provide a voltage gain equal to its step up ratio. This is like having a two stage amplifier, with the first stage being noise free. In essence then, the equivalent input noise that the op amp does have is effectively **reduced** by the transformer's gain! The net gain of the circuit is simply the product of the transformer step up ratio and the gain of the op amp, which is operating in the non-inverting configuration.

In the example shown, the transformer ratio is optimum for the 725, a premium low noise unit, but it also works well with a 709. Naturally, the transformer should be a high quality, well shielded unit. Phantom

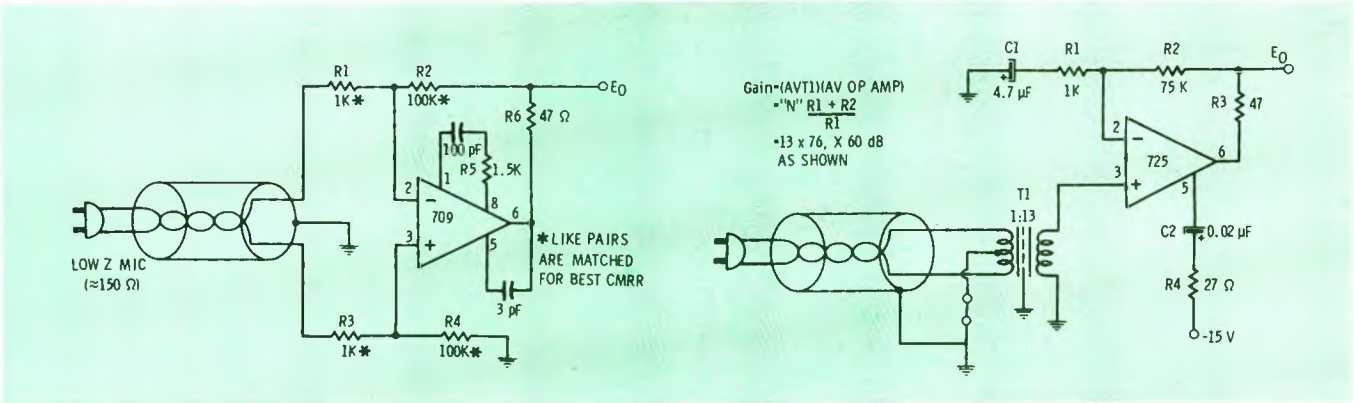


Fig. 1a Transformerless differential input microphone preamp.

Fig. 1b Transformer input microphone preamp.

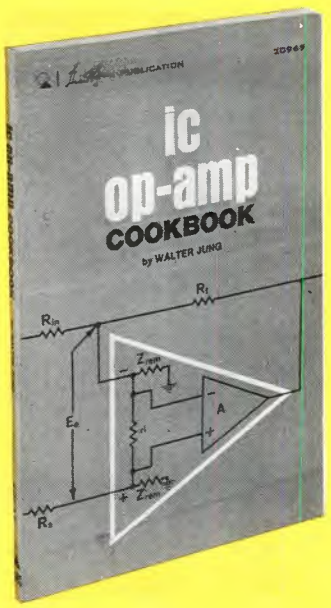
mic power can be used by breaking the grounded Ct and applying the DC between Ct and ground. If you want to operate at a lower gain overall, adjust the compensation of the op amp for the new working gain of the op amp as if the transformer were not used, that is, the gain dictated by $\frac{R1 + R2}{R1}$.

This circuit is best at high gains where the ultimate in noise performance is required. With the devices mentioned, it is not a great problem to get equivalent input noise voltages of -125dBm or better using a low Z mic. You can make the gain variable by using a pot for R2, but if this is done the op amp must be compensated for the lowest gain setting used. A 709 is suggested if this is done, as the 725's very low slew rate makes it difficult to use at low gains.

Phono Preamp

Another form of preamp circuit of fundamental use around the station is a RIAA equalized phono preamp. A high quality version is shown in Figure 2.

Most BE readers are probably familiar with the RIAA playback equalization characteristic; reference gain at 1kHz, breaking upward at 500Hz and downward at



The IC Op Amp Cookbook

As mentioned earlier in this series, Walt has written a fascinating and easy-to-read book on Op Amps. It's due off the press at the Howard W. Sams Company early next month. In this Cookbook, Walt goes into more detail in subject areas only touched on in this series as well as straight-forward, easy to understand circuits that we all should know.

For further information on Walt's IC Op Amp Cookbook, drop a line to: Bill Oliphant, Howard W. Sams Company, 4300 W. 62nd Street, Indianapolis, Ind. 46268. The book ID number will be 20969.

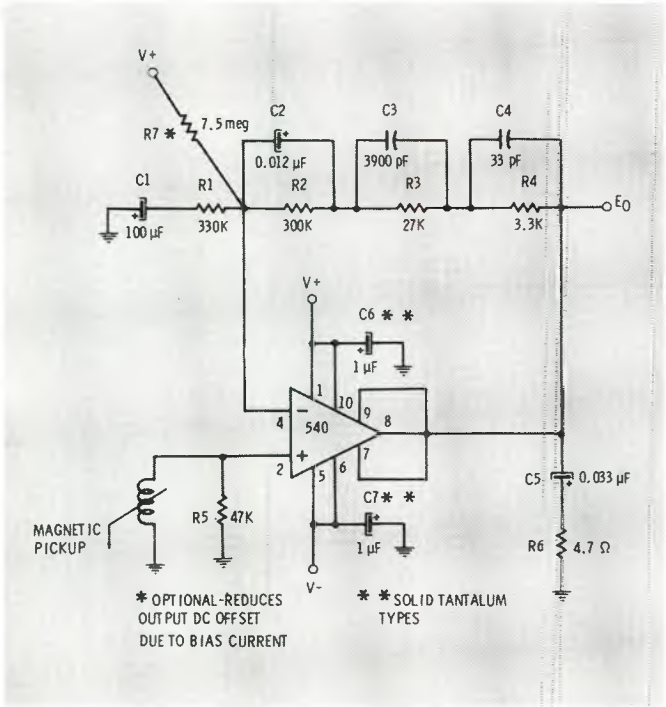


Fig. 2 RIAA phono preamp.

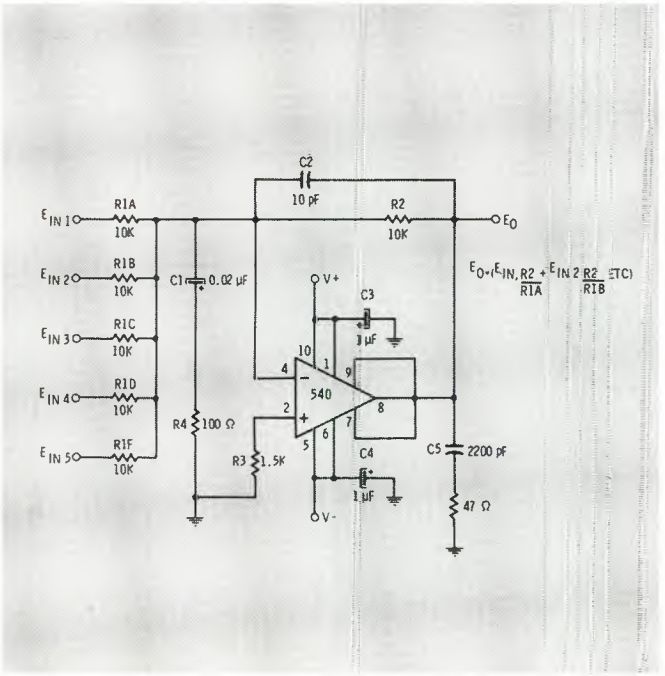


Fig. 3 Summing amplifier combines multiple inputs without loss.

2.1 kHz, and continuing a decade below and above these two frequencies, respectively. To accomplish this equalization in an op amp circuit requires that a network with an inverse characteristic be placed in the negative feedback path-the result is then the RIAA playback characteristic with equalization, gain, and buffering accomplished in a single stage.

The function of the various feedback components of Figure 2 are best understood if approached from the lowest frequency extreme-in this case about 10Hz. At this frequency, all capacitors except C1 appear as open circuits, and the gain is $\frac{R1+R2+R3+R4}{R1}$, in this case about 60dB. At 50Hz, C2 reacts with R2 to drop the gain 3dB, and it drops further with increasing frequency until at 500Hz C2 reacts with R3 & R4 to put a stop in the gain rolloff. The ratio of R3+R4 to R1 sets the gain at 1kHz, or the reference frequency gain, in this case 40dB. At 2.1 kHz C3 shunts R3 and the gain begins rolling off once again, and were it not for R4 it would continue on down to unity. The values shown yield an RIAA curve which is accurate to better than 1dB over most of the frequency range, the greatest error occurring above 15 kHz. This is due to R4, which will be explained in a moment.

Choice of an op amp for this circuit will generally be in terms of low input noise, and best bandwidth and slew rate with unity gain compensation. However, this presents a problem, as few types have both low noise and high speed with unity gain compensation. And, especially for professional use, you often like to drive 600 Ohm loads to boot.

Figure 2 sidesteps these problems by using a 540, an IC op amp with power capability (2). The 540 also has a low input noise, and the compensation shown (C5-R6 and R4-C4) allows a 10mHz bandwidth to be realized. What this means is that it will have 20dB more feedback over the useful audio range, which is a real bonus, and it can drive 600 Ohm loads to levels of +20dBm or more with very low distortion. Another bonus of the 540 over most standard IC types is a greater power supply range. If you run it at ±20V, for instance, you not only can get appreciably more power from it, but it is also less susceptible to input overload with high output cartridges and/or high velocity discs.

You can also use a 709 here if you want, just delete C5-R6, C4 and R7, and add the 709's compensation components for 20dB gain.

Summing Amp

Audio summing or mixing amplifiers are another task which can be well satisfied by IC op amps. The concept of active mixing allows the combining of virtually any number of different signals without loss in the mixing process, and with no interaction or crosstalk between signals. The output is a linear combination of all inputs applied, and if desired the signals may be scaled up or down in level, either individually or on a composite basis.

Figure 3 is an IC summer which uses the 540 as the gain element. You'll be able to recognize this one as a modified inverter, or actually an inverter with multiple inputs. Gain from each input to output is simply $\frac{-R2}{R1}$, where R1 is R1a, R1b or so on. As shown, the gain is unity and there are five inputs. More inputs or gain scaling may be accomplished if that's what you need.

The 540 is again used here because of its power output, bandwidth capability, and excellent performance. For best results stick to

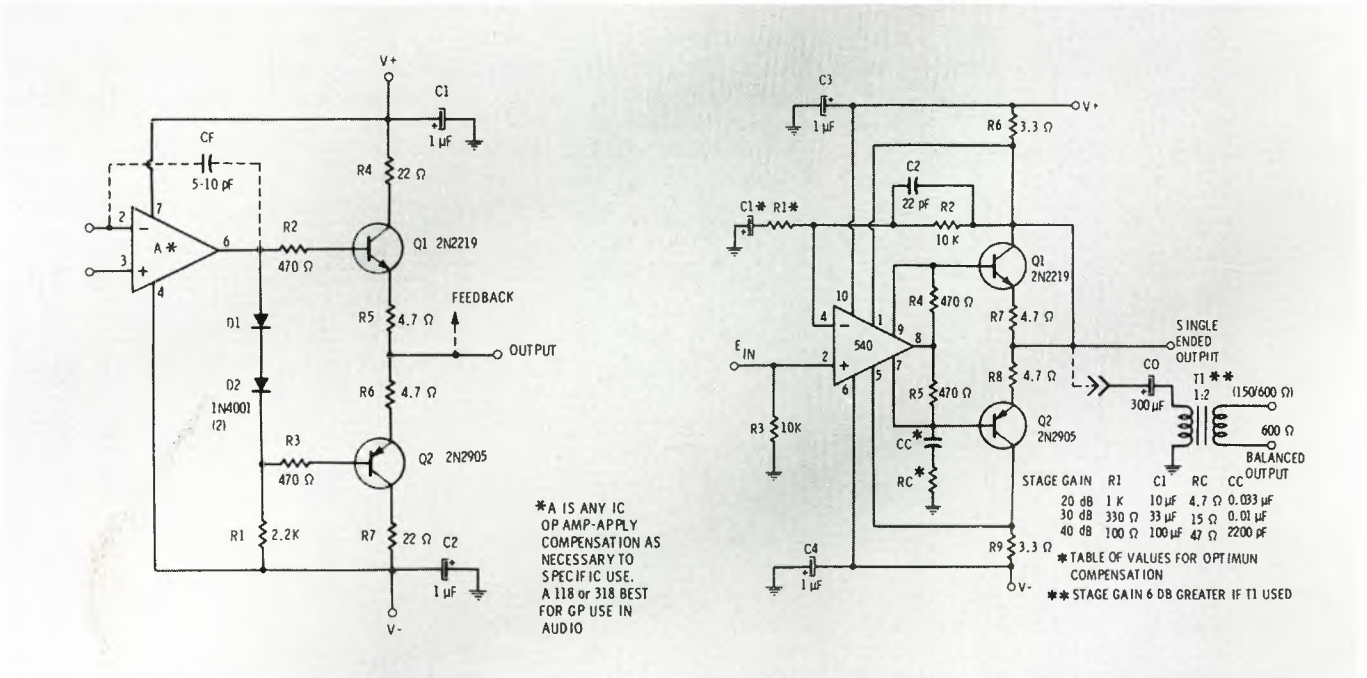


Fig. 4a A general purpose Class AB amp. Output buffer is useful with any IC op amp.

Fig. 4b Line driver stage has optimum compensation for any gain.

R2 values near 10K, and don't forget that by passing on the supply lines. The 540 has sufficient bandwidth to self-oscillate at RF frequencies unless you nail down the supply lines with good RF bypasses. Actually this practice is true for a great many IC op amps, not only the 540.

Power Booster Stages

Since we've just discussed an IC type with moderate power capability (the 540) you might wonder why other medium power boosted op amp stages would be necessary. Actually, there are many places you may have need for a general purpose booster stage to soup up a given op amp and give it extra muscle, so let's take a look at one.

The circuit in Figure 4a is a class AB output stage which can be used with any IC op amp, and will raise its current capability to ±100 mA or more. There are many ways you can build such a booster circuit, but this version is relatively simple, inexpensive, quite important for audio, and it does not add any crossover distortion. The lack of crossover distortion is due to D1-D2, which bias transistors Q1-Q2 to a small idle current. R1 forces the op amp to work in a class A output mode (most op amps have interval AB or B class output stages which in themselves can give distortion. The constant current in R1 eliminates this). Q1 and Q2 are general purpose units, while R2 and R3 suppress parasitic oscillations of Q1 and Q2, which are possible if they are the high speed types shown. R4 and R7 protect Q1 and Q2 against short circuited loads, and R5-R6 set their idle current.

Specific circuit values are not overly critical, and you'll find good tolerance to limited component deviation. Most of this "leeway" is because overall feedback is taken after this stage, thus it becomes part of the total op amp. If you have stability problems, (which you may, with high speed op amps like the 118/318), add a small cap around the op amp, Cf. The op amp you use can be selected to optimize other characteristic with-

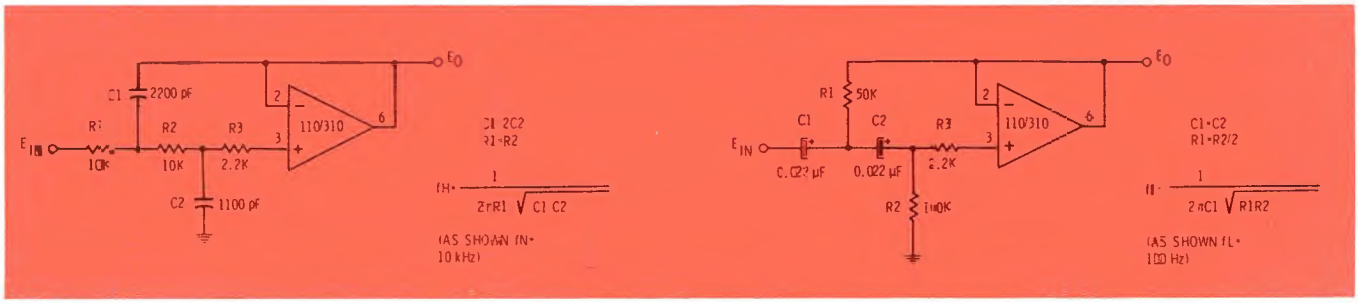


Fig. 5a Low-pass filter has unity gain in passband, rolls off 12dB/octave above cutoff.

Fig. 5b High-pass filter has unity gain in passband, rolls off 12dB/octave below cutoff.

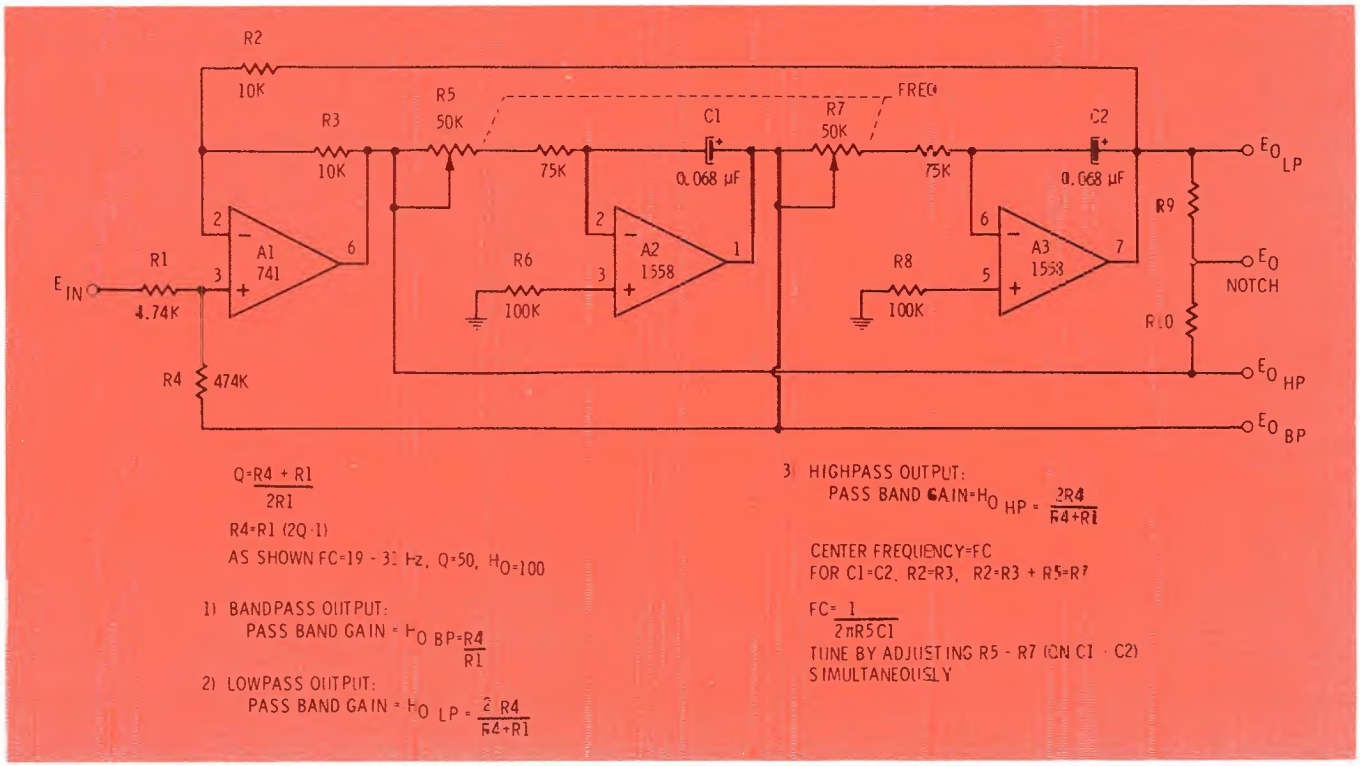


Fig. 5c Variable filter "does everything": HP, LP, BP, and notch with high gain and Q.

out regard to output power. The 118/318 type mentioned, when used with this stage makes an excellent general purpose op amp, one which can be used in almost any audio application with good to excellent results.

To get more specific in terms of boosted amplifers stages, Figure 4b offers even better performance for circuits such as line driver and distribution amplifiers. This circuit uses a 540, which as an externally compensated type, allows the compensation (CcRc) to be optimized for various stage gains. This yields maximum feedback over the audio range.

Although the 540 by itself is capable of a 1 Watt output, it should be boosted for absolutely best performance when driving 150 or 600 Ohm loads, such as you would want for professional use. Since it has current limiting and biasing for the driven transistors built in, it also can yield a relatively simple hookup.

The circuit can deliver over 1 Watt of very low distortion audio, and can be easily adjusted for the gain you need, with R1. You can use it single-ended; or by adding C_O and T1, you can drive 600 Ohm balanced lines. Using an output transformer like this is a useful trick, as it gives a voltage stepup (1:2 here), and it also gives a gain and power boost, (6dB here) increasing the power output available before clipping. If you want to use the circuit as a distribution amp, add a C_O -T1 output for each line to be driven, plus a 150 Ohm resistor in series with T1's primary. This gives you 4 isolated outputs of +20 dBm power capability!

Active Filters

One class of uses for which IC op amps are ideally suited are active filters. Active filters are just what their name implies, circuits which perform filtering functions such as low pass, high pass, bandpass or notch; but do so with amplifiers as an integral part of the filter. With op amps, filters can be very easily synthesized using only R's, C's and the op amp gain blocks. Bulky, expensive and hum sensitive inductors are eliminated, and for very low and audio frequencies, active filters can easily out perform their passive counterparts and can yield buffering and gain.

A good example of a very useful, yet simple active filter is the low pass filter of Figure 5a. This circuit is based on a voltage follower op amp configuration, so it has an inherent gain of unity in its passband. The cutoff frequency fH is set by R1-R2 and C1-C2 in the relation shown, and the values shown give a 3dB point of 10kHz. Above cutoff the filter has a fast rolloff, dropping 12dB/octave. R3 is a protection resistor for the input of the op amp used.

Closely related to the low pass filter is the high pass version of Figure 5b. This one is also unity gain and rolls off with a 12dB/octave slope below its 3dB point.

In both filters, stable R's and C's should be used for best results. You can tune these circuits with either the R or C, but practically ganged R's and switch selected C's work

out best. Keep the ratios shown, as these give the maximum useful bandwidth up the 3dB point, without peaking or early rolloff. You'll generally want to minimize the C values, and this means larger R's. You can use a 110/310 IC type with R's up to a meg or slightly more with little problem. The 110/310 is also a very fast amplifier; therefore, it will not give you any slew rate problems for audio work. On the other hand, you can also use general purpose units like 741 types, if you stick to lower resistances and lower frequencies.

There are many variations you can use on these two filters, as well as many other types of high and low pass, and even bandpass, offering variations in gain and Q, and signal inversion. Unfortunately, we just can't cover them all in the space here. However, what we can do here is take a look at one which puts it all together, as in Figure 5c.

This filter, which may seem at first glance to be overly complicated, packs an overwhelming amount of performance and is capable of realizing virtually any type of filtering function with high gain and high Q. I won't go into all of the theory behind it, just that which you need to use it. You'll note simple gain equations for the three basic outputs which allow you to set up the gain and/or Q you need for a given use, and a simple equation for the center frequency. By summing the LP and HP outputs through equal resistors, you can get a fourth output, a notch at the center frequency.

Tuning is done with either R5-R7 and/or C1-C2 which must track. Note that frequency and Q can be set independent of one another in this circuit! You can get gains and/or Q's up to 50 or more with this circuit with stability which is quite remarkable. The example shown, for instance, has a Q of 50 at a nominal frequency of 25Hz and uses only 0.068uF capacitors. Did you ever try to make a sharp bandpass filter to detect low level tape cueing tones? You can bet this circuit will do it for you, and with a reasonable amount of parts. As before, use good R's and C's for tuning, and stable types for the R1 and R4 gain resistors and R2-R3. For low frequency work below about 1kHz and moderate Q's, 741's are OK. If you want high frequencies and high Q, use high speed units like the 118/318 types.

Uses of the state variable filter can be many: to notch out hum for program material; to "clean up" a tone source if necessary; as a high pass; as a low pass; or special type of equalization, with easily adjusted frequency, gain and Q.

Summary

At this point we've covered a number of audio applications of IC op amps, in both a general and a specific sense. Hopefully the material is useful to you either as a circuit or as the general idea behind it.

Over the course of this series we've discussed a great many different uses of op amps which I thought would be most useful to you. One drawback of this ap-

(Continued on page 78)

PEOPLE IN THE NEWS

Dyma Engineering has announced the appointment of **Ronald L. Cockrill** to the position of Vice-President, Manufacturing....The appointments of **Bernard Bakst** and **Kenneth V. Spitzer** to Corporate Vice Presidents were announced by Amperex Electronic Corp...JVC Industries, Inc. has named **Gene Maffei** National Administration Manager and Assistant National Sales Manager....**Bruce Woodward,** formerly Interdesign's manufacturing manager, has been elected a Vice President of the corporation.

James L. Stinson has been named Distributor Sales Manager for Western Digital Corp....**Joseph J. O'Donnell, Jr.** has been appointed manager of advertising and public relations at Metrologic Instruments, Inc.... **Rex C. Bradford** has been named manager of digital head engineering by Nortronics Company, Inc....**David K. MacDonald** has been promoted to national product manager of the VTR Division of Sony Corporation of America....**Larry Howard** has joined Instrumentation Engineering, Inc. as Government Marketing Manager for the Washington, D.C. area.

Ronald L. Cockrill

Bernard Bakst

Kenneth V. Spitzer

Romeo Doty has been appointed Manager of Administrative Operations at TRW Semiconductors....The appointment of **Juhani Hamalainen** as Manager, Reel-to-Reel Recorder Product Management, for RCA Broadcast Systems has been announced....**Vincent F. Isgro** has been named advertising and sales promotion manager for the Industrial Products Division of Fairchild Camera & Instrument Corp....**Reynaldo R. Perez** has been appointed National Product Sales Manager and **Glenda A. Walker** was promoted to Product Sales and Service Coordinator for Ameco, Inc.

Shure Brothers Inc. has announced the promotion of three members of its domestic distributor sales department. **William Harlan** and **Lottie Morgan** have been promoted to sales positions with responsibility for the sales and promotion of existing distributor products in

(More...)

Gene Maffei

Joseph J. O'Donnell, Jr.

David K. MacDonald

NAB Management

(Continued from page 54)

Rep. Van Deerlin called for lifting restrictions on broadcast in Congress and the courts. He said radio and television are entitled to equality with the print media and he strongly favors broadcast coverage of "the impending impeachment proceedings."

Turning to broadcasting's relations with Congress, Rep. Van Deerlin said it is a "basic right of all citizens—including broadcasters"—to be heard by their elected representatives.

Rep. Brown, the ranking Subcommittee Republican, supported the need for "honest, strong lobbying" in Washington, but he indicated that many industry groups do not anticipate or analyze legislation carefully enough.

He cited the new Consumer Protection Agency legislation as an example of a law which could vastly affect all segments of industry. Many trade groups, he said, ignored it as it wended its way through the legislative mill over a five-year span.

Rep. Brown complimented broadcasters for their on-going Congressional relations activities. He said the most effective method is to maintain "good grass-roots relationships with members of Congress" and the subcommittee level is the best target for such efforts.

150 Companies

The world's largest display of radio and television broadcast equipment opened at the 52nd annual convention of the National Association of Broadcasters.

The exhibit, estimated to be worth $100 million, covered some 69,000 square feet of floor space in one of the nation's biggest convention centers.

A large crowd of radio and television management and engineering executives from throughout the United States and overseas was on hand for the formal opening.

More than 150 equipment manufacturers, associate members of NAB, displayed their wares. Foreign countries, represented through distributors, include Great Britain, Japan, Canada, Holland, France, West Germany and Switzerland.

People

(Continued from page 61)

specifically designated representative territories. **John Phelan** has been named product coordinator and will be involved with various stages of new product development, field testing and market research....**Thomas C. Butler** has joined the Data Communications Division's marketing organization and has been appointed Manager, Marketing Services....The appointment of **Edward Mullen** to the newly created postion of Director of Engineering of Ampro Corp. was recently announced.

CATV

Frank D. Staley has been promoted to New England District Manager in TelePrompTer's Cable Television Division....Cox Cable Communications, Inc. announced that **Carmen DiLego** has been named Regional Manager of the Company's Northeast operating region, and **William L. Vogel** has been named Regional Manager of the Company's newly-created Mid-East Region....**C. Steven Henry** has been appointed manager and chief technician of Continental Cablevision's Galion, Ohio system and **James D. McTurner** has been promoted to manager and chief technician of the Athens, Ohio system.

C. Steven Henry

James D. McTurner

Ronald M. Peters

Donald R. Kampman has been elected a vice president of General Cable Corporation (NYSE). **Ronald M. Peters,** General Manager of General Cable Corporation's Steel Operations, has been appointed an Operations Vice President of the corporation....**Guy H. Rachau** is the new Sales Administrator for C-COR Electronics, Inc....**John F. Wohlhueter** has been elected president of General Wire & Cable Company, Ltd., a subsidiary of Belden Corp.

The Magnavox Company, CATV Division announces the appointment of **Robert L. McAllaster** to its regional sales force....**K. Blair Benson,** director of audio-video engineering, Goldmark Communications Corp., has been appointed broadcast television chairman of the Cable TV Engineering Committee for the Society of Motion Picture and Television Engineers application engineering activities....**M. E. "Gene" Robinson** has been promoted to Western Regional Manager for Anixter-Pruzan.

John F. Wohlhueter

Robert L. McAllaster

Gene Robinson

Endorsed Article

Using Logic With ID's Part 2

By Bob Zuelsdorf

Multiplexer interface requires the determination of mirror positions to feed the TP-7 slide projector to film camera #1 (F1) and to film camera #2 (F2). These mirror positions indicate functions C and D in Table I. The multiplexer in use when the ID Logic was put into operation, an RCA TP-15, has limit switches which might have been used to indicate mirror positions. However, activation of the "Interlock Defeat" switch removes the 24V supply from these switches, interrupting the logic information, so we had to mount additional switches to provide position information. Long lever snap-action type switches were used. These are S9, S10, S11 and S12 of Figure 7.

Logic outputs from the ID-1 card are fed to ID-3 (Figure 8) cards to

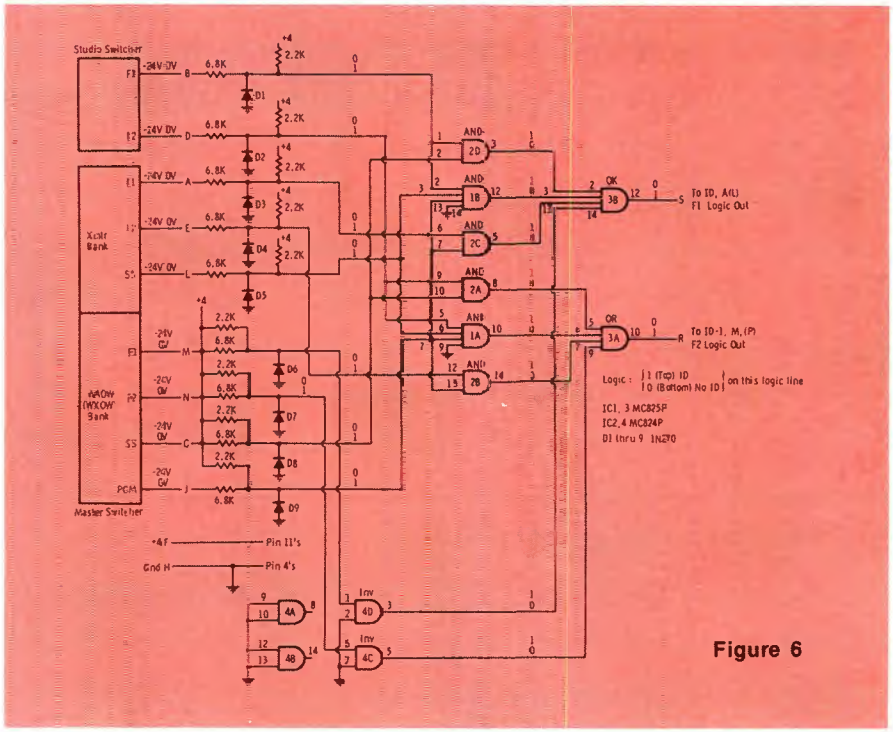


Figure 6

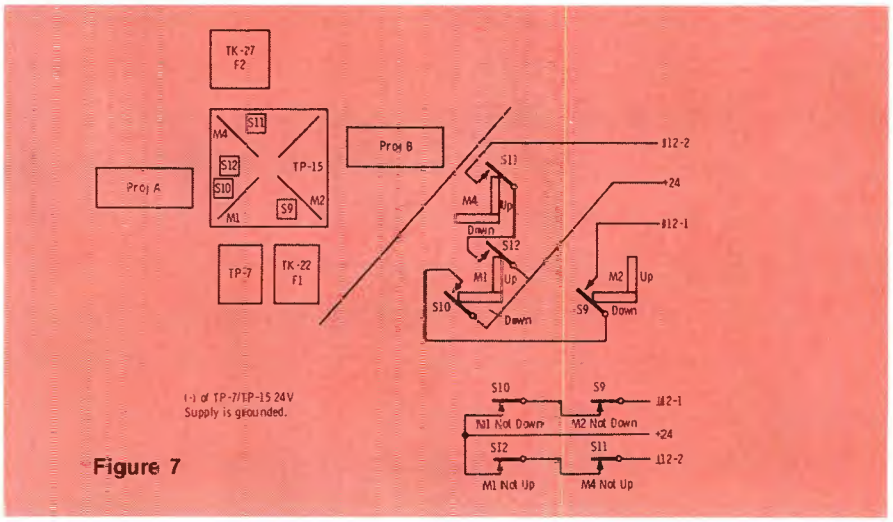


Figure 7

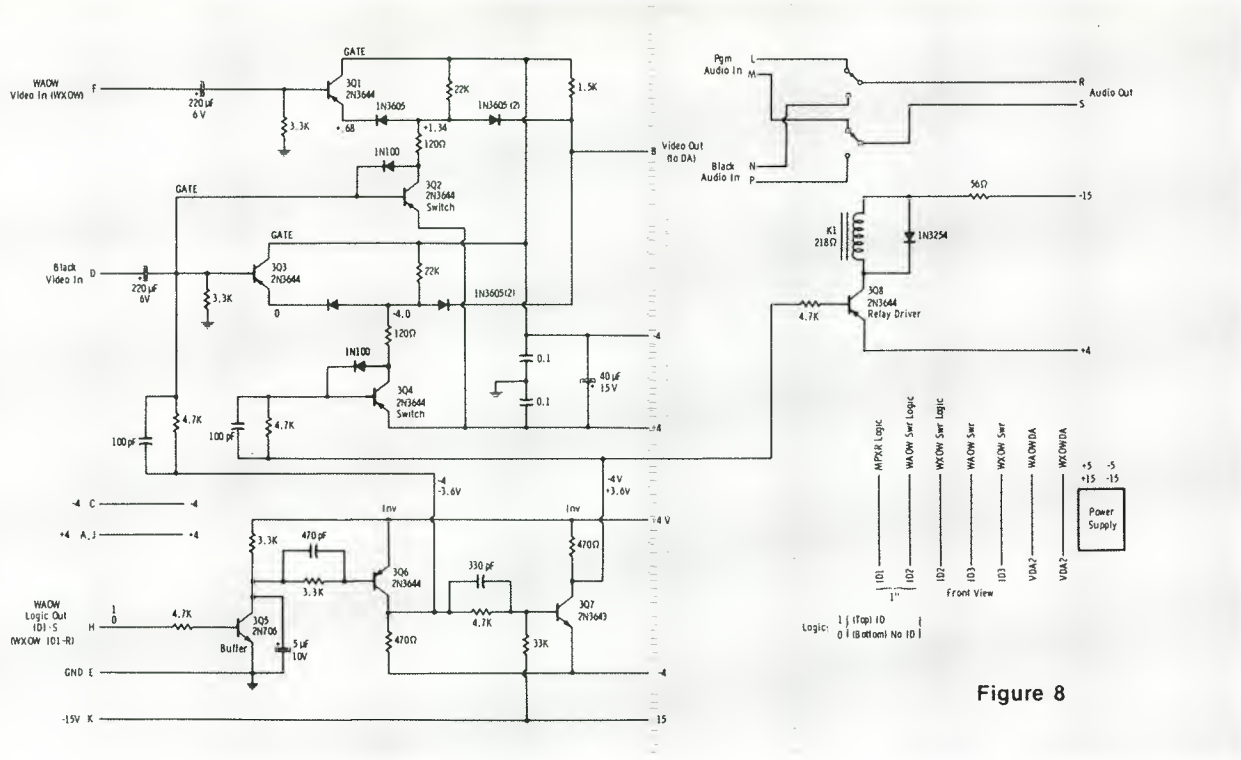


Figure 8

control switching. Video switching is handled by emitter/follower diode gates. Normally the 3Q1 gate is on and the 3Q3 gate off (Figure 8). When the logic senses an ID feed, the state is reversed, with 3Q3 being turned on and 3Q1 turned off. This allows the substitution of black, or some other video source, for the ID video.

Output from the gates is fed to a video distribution amplifier having high input impedance. The gate driver transistors 3Q5, 3Q6 and 3Q7 also feed a relay driver, 3Q8. The relay, 3K1, handles audio switching.

Relay switching is adequate for

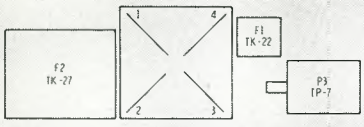


Figure 9

the audio as sub-millisecond switching is not necessary. Video switching requirements are more stringent. When an ID is punched up on either switcher, a delay in the millisecond range would allow a portion of a field to air. For a clean switch to black, the delay should be less than one line. The gating circuit used is capable of switching in less than a microsecond, but the logic signals are processed to reduce speed somewhat.

We found that in turning the slide lamp off the photocell would sense a "No ID Slide" condition before the video was completely gone. A 5 mf at 10V capacitor was added from 3Q5's collector to ground to alleviate this problem.

Video Gate Operation

Consider first the upper gate in Figure 8. With 3Q2 turned on, 3Q1 acts as an emitter-follower. Both diodes are forward biased and the 120 Ohm resistor acts as an emitter resistor for the emitter-follower. Video is passed from the emitter of 3Q1 through both diodes to the video out terminal. Note that the potential on this terminal is the same as that on 3Q1 emitter.

Looking now at the lower gate, we find 3Q4 turned off. The 22K resistor pulls the junction of the two diodes to the -4V supply. This back-biases both diodes and the base-emitter junction of 3Q3, leaving an open circuit for the video on 3Q3 base.

When an ID is sensed, the gate drivers, (3Q6 and 3Q7) reverse the states of 3Q2 and 3Q4, allowing passage of video from 3Q3 base to the output and inhibiting passage of the video on 3Q1 base. Thus black video is substituted for the ID. The 1N100's prevent hard saturation of the switch transistors, greatly reducing storage time.[4]

In 1971 the TP-15 multiplexer was replaced with a TP-55, requiring modification of the interface circuitry. The TP-55 utilizes photocell sensors to access mirror positions. The Mirror Logic Module uses these inputs to generate "up" and "not up" (U and $\bar{U}$), "down" and "not Down" (D and $\bar{D}$) signals for each of the four mirrors. It is necessary then, to determine the combinations or mirror positions which will feed a slide to each of the cameras and to use this information in logic design of the ID logic drivers.

Optical Layout

Figure 9 shows the optical layout used for this film island. The diagram reveals the logic for a slide to film camera #1 (F1) is mirror #3 "not down" AND mirror #4 "not Down," while F2 = $(2\bar{U})$ $(3\bar{U})$. Note that there is a difference in a mirror being "down" and that mirror being "not up". Thus $3\bar{U} \neq 3D$, for example. This difference is important in selecting the required logic function because a slide must be sensed upon initiation of a mirror movement feeding it to a camera, rather than on completion of that mirror movement.

Once the logic function is known it is not a difficult matter to implement the circuitry. There is room in the Mirror Logic Module of the TP-55 for mounting of an extra circuit board. A single CD2201D quad NAND gate handles the logic, as shown in Figure 10, with two 2N3904 emitter-followers being used to interface the Low Power DTL to RTL. The copper foil connecting J3-10 to ground was cut away to free this pin for ID Logic use, while J3-16 is an unused pin on the Mirror Logic Module. On the ID-1 card it is necessary to jumper the 15K resistors at 2C-7 and 2D-9 as the logical 1 level driving these inputs is now + 4V instead of the + 24V used with the TP-15 multiplexer.

The ID Logic has been in operation nearly five years and has functioned satisfactorily over that period. It has eased operating requirements on both ends of the network and has been of aid in preventing the airing of undesired material. The fundamental system is flexible, allowing for more inputs or outputs, depending upon the design equations used. Uses beyond the elimination of ID's are possible. For example, it may be desired to key a local insert slide over film video at the originating station without having the insert air on the network. This can be done automatically by notching the insert slide and feeding film video and audio to the "black" inputs. This and other specialized routines may be performed in addition to the functions for which this unit was conceived.□

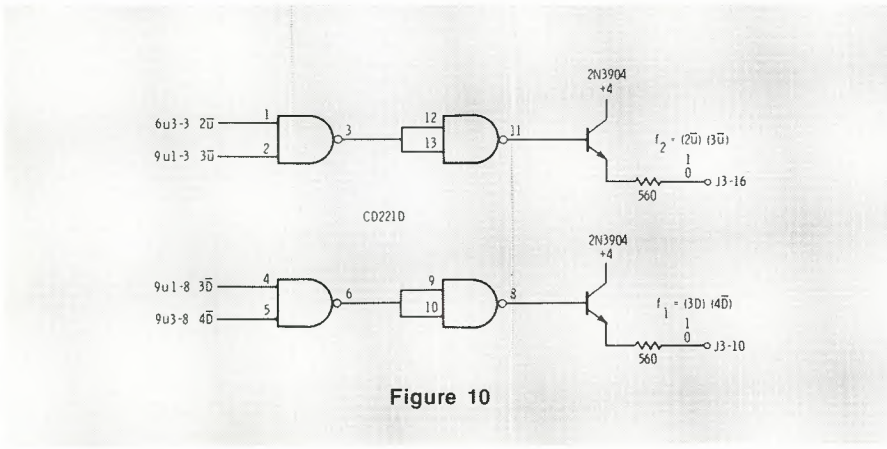


Figure 10

Footnotes

1. J. Millman and H. Taub, **Pulse, Digital and Switching Waveforms** McGraw-Hill, 1965. pp. 306-335.

2. Motorola Application Notes AN234, AN252, AN253.

3. **The Microelectronics Data Book,** 2nd Edition, Motorola Semiconductor Products Inc., 1969.

4. Reference 1, pp. 297-300, 772-778.

NEW PRODUCTS

Remote Control Monitors

The new **Delta** combination remote control unit provides for the control and digital remote readout of Model DAM-1 Antenna Monitor and up to 15 transmitter meter readings. On/raise and off/lower controls are also provided for 15 functions and 8 alarm indicators are provided on the remote unit.

The transmitter interface unit selects any one of 15 DC voltage inputs and the DAM-1 amplitude digital readout provides local display of transmitter or antenna readings. Digital data and control signals are handled by a single voice grade telephone line by means of self-contained FSK modems.

The system provides the accuracy of digital transmission and readout of data with analog to digital conversion in the precision circuits of the DAM-1 Antenna Monitor.

For stations that do not require transmitter control and monitoring the DAML-1 and DAMR-1, remote control units are available for control and readout of the DAM-1 Antenna Monitor.

For More Details Circle (93) on Reply Card

Electronic Titling System

Chiron Telesystems now has available a medium price electronic titling system called the Mark III that offers font versatility, fast access and good character quality.

The keyboard provides full upper and lower case characters. Seven colors, including white, are key selectable. Cursor control is provided on the composition (edit) display. Features include: EOM and RM message and control; center line; center page; and flash character.

Options include: insert character; delete character; delete row; insert row; justify; shift character horizontally; and shift row vertically.

For More Details Circle (94) on Reply Card

Compressor/Limiter Expander

Broadcast Electronics introduced their "Sound Britener" CLE-500, designed to provide automatically controlled clean, crisp audio without the danger of over modulation.

The CLE-500 combines compressor, limiter and expander functions to provide optimum level for maximum modulation and coverage. The manufacturer claims signal processing is smooth and quiet without distortion, pumping, or sucking of background noise. The unit contains all the characteristics of traditional gated automatic gain control amplifiers and fast acting peak limiters.

Automatic and self-controlling functions within the CLE-500 eliminate the need for several companion units. Only three controls are needed: Input level control that accepts normal program levels over a 50 dB range; Output level control to match any 600 Ohm transmitter line; and a unique peak-to-average "tightness" control.

For More Details Circle (95) on Reply Card

(More...)

Audio Mixing Console

Robins Fairchild now has available an audio mixing console - the model 1632 - that provides 16 input channels and can handle 64 sources.

Important features are: three submaster mixing channels for 2 + 1 effects channel; dual output program channels - one line plus four distribution outputs each; solid state Op Amp circuitry with low noise, low distortion, high output capability (+24 dBm).

Pushbuttons are illuminated to aid active mixing and switching, VU meters are included, and the console has two monitor output channels - separate studio and control room monitoring with muting relays.

For More Details Circle (96) on Reply Card

TV Transmitter Color Phase Equalizer

Datatek offered a TV transmitter color phase equalizer and waveform corrector system, the D-701.

The unit features continuously variable smooth curve and discrete correction for both amplitude and phase. The waveform corrector portion is designed to improve performance of transmitters already equipped with video or IF delay equalizers. It corrects for waveform undershoot and overshoot errors causing streaking and smearing, and it may be used to remove the effects of suck-outs, resonances, and reflections due to mismatches.

Adjustments may be made during program using standard VIT signals as a reference.

For More Details Circle (97) on Reply Card

TV Translator

Rodelco exhibited a 10 Watt UHF translator that is fully solid state. That 10 Watt rating is for visual, aural is 2 Watts.

This unit includes independent controls for both visual and aural levels and power indications for both. Features include low differential gain and phase, full metering, selective input filtering, low power drain, and it can be AC or DC powered.

For More Details Circle (98) on Reply Card

TV Studio Titling System

Video Data Systems has introduced their T-1000 titling system that features two channel output: one program and one preview.

Specs include synchronous to composite video, full editing capability, vertical interval page switching, two page memory (each page 8 lines of 16 characters), and character blink.

The T-1000 uses a standard electric typewriter style keyboard, two character sizes, and has a one or two line window selection capability.

For More Details Circle (99) on Reply Card

Battery Operated Portable TV Camera

As you can see from this month's group of new products, the NAB convention was seeing for the first time, a wide variety of hand-held color TV cameras. **Bosch Fernseh,** whose cameras dominated the originations of the last Olympiad, introduced their version of a portable camera with the KCN.

This self-contained, battery operated unit does away with a trailing bulky cable, is lightweight, and the color video signal of the KCN can be fed to a portable high frequency transmitter, a microwave link or a video tape recorder. This unit includes a built-in color bar generator. Lens options include Canon and Cooke Varotal.

For More Details Circle (100) on Reply Card

Multiple Cart Playback System

Schafer Electronics Corporation in-

troduced six new additions to the Schafer product line at the National Association of Broadcasters convention.

The AUDIOFILE, a new multiple cartridge playback system capable of triple-spotting between three rows of sixteen cartridges gets the center of attention.

The Schafer AUDIOFILE holds and plays a total of forty-eight NAB standard cartridges. Schafer spokesmen quoted prices competitive with the older-style round multiple cartridge unit, but indicated that the all-electronic AUDIOFILE is three times more efficient, more compact, and has audio quality equal to the best single-play cartridge machines. As an accessory to the AUDIOFILE, Schafer introduced an expandable 1000-step sequential MOS Memory capable of programming random selections from up to nine AUDIOFILES and ten additional tape machines or other sources. This accessory programmer makes the AUDIOFILE compatible with smaller, or older-design automation systems, or can be used to provide advance programming in a live studio operation.

For More Details Circle (101) on Reply Card

Freq And Modulation Monitors

Belar Electronics Laboratory was exhibiting their line of AM and FM monitors, but some were surprised to see the company working the TV side of the monitor market as well.

Belar has a digital readout TV frequency monitor called the TVM-2 and TVM-3. These are rack mounted units that can be read across a wide room.

The companion unit - the TVM-1 - is designed to monitor TV modulation. Belar also has available a TV amplifier they call the RFA-3. While Belar does specialize in all types of frequency modulation monitors, they also have an antenna line. More on that later.

For More Details Circle (102) on Reply Card

Digital Video Synchronizer

Consolidated Video Systems, developer of the first digital video signal corrector, introduced its newest product, the CVS 600 Digital Video Synchronizer. The CVS 600 solves a basic television signal transmission problem.

What has long been required is a "hands off" method for locking an incoming signal to house sync. This is the role of the CVS 600 Digital Video Synchronizer. Whether the remote in-

(More...)

put be from telco lines, microwave or satellite, the 600 synchronizes that signal with respect to a reference input.

Locking station sync to an incoming signal has traditionally caused countless problems. In addition to all the "fades to black" that surround a switch back to station sync, the ever present vertical roll simply is not "state of the art" broadcast television in 1974.

The CVS 600 Digital Video Synchronizer is priced at $37,500. It may be 19" rack mounted. Deliveries begin in July, 1974.

For More Details Circle (103) on Reply Card

FM Stereo Monitor

Time And Frequency Technology (TFT) introduced a new stereo monitor called the model 724.

In rack configuration and typical straightforward panel design, this unit includes a phase-locked-loop stereo demodulator, and has large, easy to read left and right modulation metering. TFT claims complete separation, crosstalk, injection and signal to noise measurement.

This unit is design for use with TFT's model 723 to provide all stereo monitoring requirements and proof of performance measurements required by the FCC. In addition to the latest linear and digital IC's, computer design filters provide accurate separation and crosstalk measurements.

For More Details Circle (104) on Reply Card

5 kW PDM AM Transmitter

The new MW-5, five-kilowatt AM transmitter, with a patented Pulse Duration Modulator (PDM), was introduced by the **Gates Division** of Harris-Intertype Corporation, at the 1974 NAB Convention.

This advance-design transmitter provides many features, including an overall efficiency of greater than 52%! The Pulse Duration Modulator produces conventional high level plate modulation, and is nearly 90% efficient.

Gates MW-5 is capable of providing the maximum positive modulation peaks allowed by the FCC (125%), with plenty of reserve for great reliability. This can mean higher average modulation levels for louder, clearer signals, with no increase in transmitter carrier power and no increase in distortion.

The entire transmitter employs just two tubes—a 3CX2500F3 PA and a 4CX3000A modulator—both operating well below manufacturer's dissipation ratings. All power supplies use long-life silicon rectifiers.

For More Details Circle (105) on Reply Card

Slide Fader Consoles

A new series of slide fader consoles was announced for immediate delivery by **Ampro Corporation.** Available

in 8, 10 and 12 channel versions in dual mono and stereo configurations, these consoles have been designed to answer the requests of numerous broadcasting and recording facilities for reasonably priced and extremely flexible units. Among other unique features, the user may have his choice of slide fader brand subject to availability of the mixer and depth provided under the panel. Boards are priced subject to fader chosen.

Like all AMPRO consoles, the new slide fader units feature: Four switchable inputs per fader, user adjustable for Mic or High-Level; Top quality lever key switches; Durable etched and filled front panel markings; 4 muting relays with programming board for feedback-free origination from 4 locations; High gain 104dB mic to program output; Shielded PC mixing bus to eliminate maintenance problems; Built-in cue/talkback system; and Built-in headphone amplifier.

For More Details Circle (106) on Reply Card

Distribution Modules

Cooke Engineering Company displayed their Dyna-mites line of distribution modules. These include the VDA 1-4 video distribution amplifier, the VEA 1 video equalization amplifier, and the PDA 1-4 pulse distribution amplifier.

On the audio side, the line shows a APA 1 audio preamplifier with input -70 to +10 dB, 250 Ohm or high impedance, 70 dB gain, 600 Ohm +10 dBm output.

Their ADA 1-6 audio distribution amplifier incorporates balanced bridging input, 6 balanced outputs at +20 dBm with low distortion and flat response.

For More Details Circle (107) on Reply Card

Experimental FM Transmitter

The Model 600BX 250 Watt experimental FM transmitter is the fruit of research by **Sparta** engineers into broadcast transmitting without AC power, in light of national concern over power supplies. One of the most forward-looking features of the compact (4'6", 300#) Model 600BX is its use of 12 Volt backup power, making possible its standby use with ordinary auto batteries.

Tests have been performed (using the 96-ampere-hour Sears Die Hard #27) which so far tend to show that typically over two hours of operation is possible from a good quality auto battery in good condition. SPARTA Transmitter Products Manager Paul

(More...)

Gregg and the engineering staff further envision use of a thermoelectric system, or windcharger-battery system, either of which could keep a 600BX-type transmitter fully operational at a remote mountain-top location without AC power indefinitely.

There are absolutely NO tubes in the 600BX; both electronics and control circuitry are solid state. All stages are completely metered, and protected instantaneously against overload. Automatic-recycle VSWR protection is standard. There is a fail-safe feature within this fail-safe transmitter; even if one amplifier goes out, the 600BX will remain on the air with the other.

For More Details Circle (108) on Reply Card

2.5 kW FM Transmitter

Wilkinson Electronics, Inc., was displaying their FM2500E 2.5kW FM transmitter. It's the one that Wilkinson claims is so stable that it requires no oven. Other company claims include distortionless and noiseless with response from 30 to 15,000 Hz with pre-emphasis.

So what's inside? A single 5CX-1500A final amplifier, vacuum capacitor tuning and loading, input and output reflectometers, an output circuit designed to end spurious emmissions and harmonics, self-testing silicon rectifiers, printed circuit control ladder, time delay and recycling, and double duty plate transformer and filter reactor that loafs under full power.

For More Details Circle (109) on Reply Card

Television Visual Demodulator

Gates introduced a TV visual modulator that drew a lot of attention. It can be used for precision measurement of visual transmitter characteristics required by the FCC and to measure other important transmitter characteristics.

Three detectors are included: diode double sideband envelope detector; standard Nyquist detector; and synchronous Nyquist detector.

The diode detector provides diode response characteristics with no bandpass limiting. An aural notch is included to allow measurement without interference from the aural transmitter.

The Nyquist envelope detector provides detection with standard Nyquist filter characteristics to allow conventional monitoring and measurement of the visual signal.

This unit provides fulltime video

outputs on the back panel for each of the three detectors.

For More Details Circle (110) on Reply Card

Modular Quad VTR

Ampex Corporation placed on the market the world's first modular design studio quadruplex videotape recorder/reproducer for professional broadcasters. This design also permits easy and economical on-location use.

The AVR-2 studio console is easily reassembled to fit portable or mobile requirements and needs minimal power to operate.

Charles A. Steinberg, Ampex vice president — general manager of the audio-video systems division, said the new high band recorder will enhance studio or remote operations and provide operating economy, flexibility and mobility.

The system is a single standard, high band recorder that meets the highest quality picture and audio standards at 7-1/2 or 15 ips available in studio quadruplex recorders today.

Production Model AVR-2s was demonstrated for the first time at the Convention in Houston in March. Prices range from $69,000 to $92,000, depending on options.

Important features of the AVR-2 include: Console-mounted, with monitor bridge, the AVR-2 is easily moved through standard doorways. In modular form for use in vans, boats, or aircraft where space is at a premium, the AVR-2 uses one-third to one-half the space needs of existing systems.

For More Details Circle (111) on Reply Card

TV Modulator

The **DYNAIR** Model TX-3A Television Modulator is designed to provide low cost, high quality transmission in MATV and other closed-circuit television applications. It accepts separate audio and video inputs from which it generates a standard TV format signal on any specified VHF channel. Other frequencies are available on special order.

The TX-3A contains a vestigial-sideband response filter and output amplifier which assure quality performance in adjacent channel color systems without the addition of external filters. The maximum operating RF output level is 250,000 microvolts with a control provided on the front panel for adjustment over a 10 dB range. The visual carrier frequency is crystal controlled, assuring frequency stability to 0.005 percent with the aural carrier frequency referenced to the visual carrier. Further output quality is achieved by clamping the

(*More...*)

input video at tips of sync, preventing variations in the RF output due to changes in the picture content.

For More Details Circle (112) on Reply Card

Modular Peak VU Detector

A new peak VU detector module Model VU306 from **Burwen Laboratories** permits sound engineers to monitor true sound levels, rather than average or RMS values, hence avoid tape recorder and transmitters distortions that occur when high signal peaks are concealed by modest average or RMS values.

The VU306 modules are intended for use in tape recording, reproducing, record cutting, and in FM broadcasting applications. They also enhance the versatility and flexibility of sound mixing consoles, simplify microphone placement in concert halls and public address installations, and add to the reproduction quality of high performance Hi-Fi installations. As a rule-of-thumb, Burwen Laboratories has found that virtually all consumer Hi-Fi music suffers from sound distortion, typically as inadequate amplifier power, or limited preamplifier dynamic range, clip off signal peaks.

For More Details Circle (113) on Reply Card

Broadcast Color TV Camera

A new broadcast color television camera offering a combination of colorimetry, resolution, signal-to-noise ratio and stability unmatched in any other studio camera, was introduced by **International Video Corporation,** Sunnyvale, Calif.

Michael A. Moscarello, IVC president and chief executive officer, said the IVC-7000 offers performance and features normally found in cameras costing up to $100,000, at a cost of $52,000.

Key features of the IVC-7000 camera are: (1) Center resolution of 675 lines and 600 in the corner, plus built-in RGB type image enhancer; (2) Signal to noise ratio of 51 dB at 100 foot candles; (3) Superb colorimetry with average color error of 0.89 jnd's; (4) Automatic digital color balance in seconds; (5) Optional automatic black and white levels and automatic centering; (6) Superior lag through bias lighting that artificially increases dark current to reduce lag. Smaller target of the 7000's one-inch tubes inherently reduces lag; (7) Total remote control of the camera head; and (8) Digitally controlled multiplexing.

For More Details Circle (114) on Reply Card

Circularly Polarized FM Antenna

The **Shively Laboratories** low power circularly polarized FM Antenna has been primarily designed for the educational broadcaster, but its excellent design and sturdy construction make it suitable for the commercial broadcaster who wants a minimum cost low power circularly polarized installation.

It is suitable for the transmission of monaural, stereo, and stereo-multiplex signals, circularly polarized. Two feed systems to accomodate various amounts of power are available.

The power capability of one element of the Shively low power circularly polarized FM antenna is one kilowatt, divided into one-half kilowatt horizontally polarized, and one-half kilowatt vertically polarized. In order to keep the cost of an installation down, two feed systems are offered. The first is the minimum system, where the input power is to be one kilowatt or less. This is a tapped system using RG 8/U solid dielectric coaxial cable.

For More Details Circle (115) on Reply Card

Automation Controller

The CD28 Modular Controller from **Control Design Corp.** represents a new concept in broadcast automation. The Model CD28 is totally solid state and uses modern, highly reliable, M.O.S. memories to store or remember all program information. The standard CD28 will allow the operator to program up to 2000 events from 12 program sources, and may be expanded to 8000 events from as many as 92 sources.

Sources may include multiple cartridge units, reel-to-reel tape machines, single play cart machines, network, etc. In addition to controlling reel-to-reel and cartridge units, the CD28 controls all "Random Access" of multiple cart machines. Due to the unique design of this unit, all multiple cartridge machines in the system are automatically random selected ahead of the operating program.

This means that each multiple cart machine has always been pre-random selected in accordance with the operating program and is ready for instant use. This built-in capability should far exceed the most demanding broadcast format.

For More Details Circle (116) on Reply Card

IC Switching System

A totally new generation of video and audio switching was shown by **American Data Corp.** The 900 series switching systems feature the first "Developed for Television" I.C. crosspoint which discretely switches video, audio and dual tallies within a single integrated circuit.

Computer interface hardware, "X-Y" Tally are now some of the standard features in systems with prices which were before considered impossible.

For More Details Circle (117) on Reply Card

Portable TV Camera

The **Commercial Electronics** CEI-290 is a live color television camera designed for "portable" and "backpack" use. It consists of these discreet packages: Camera head with lens; back-pack/electronics unit; detachable viewfinder and Bell hip pack with mounting adapters for the above items; Camera Control Unit, including NTSC encoder and operating control panel.

This system is designed so that the CEI-290 and CEI-280 Camera Control Units are interchangeable for greater flexibility, continuity of maintenance, and cost advantages.

The CEI-290 has the added advantage of being used as an additional studio camera by easy mounting on a studio tripod and replacing the field viewfinder with a quick connect 7" studio viewfinder.

Added features include: Lens, 10-1 Angenieux F 2.8; Remote Distance, Up to 600 feet from Camera Control Unit; and Camera Flexibility, Head may be operated up to 30 feet from viewfinder and backpack.

For More Details Circle (118) on Reply Card

Cartridge Tape Machines

I guess if you tried to trace automation you might say it all began when some engineer tied two record changers in tandem. From those dark ages we found ourselves moving toward wall-to-wall controls....and the record changer concept became a laugher.

Somewhere in between there is a middle ground approachable through tape cart machines. With the advent of the multiple deck machines and the random select models, we began to fill in the gaps.

At the convention we were once again reminded of the vast array of automated tape equipment. There were a number of manufacturers exhibiting machines (see our Buyer's Guide issue). One line we caught was by **International Tapetronics.**

Called the 3D series, the basic unit is a three cart reproducer in the space normally occupied by two machines. The program reproduce amps include an IC "squelch" that turns off the audio when the deck is in idle and permits the mixing of all three decks into one console without sacrificing the S/N ratio. Automated breaks can be set up with each deck starting the next deck by using a 150 Hz cue. In rack configuration, you can mount two units side by side for a six deck train.

For More Details Circle (119) on Reply Card

Low Cost Time Base Corrector

There were additions to the growing list of manufacturers offering time base correctors, among them was **Dynasciences.**

The TBC 5000 is designed for use with any monochrome or color VTR from ½-inch to 2-inch, including helical, quad, and cassette.

Whether you have a VTR that is power line locked, capstan servo'd/V-locked, or H-locked, the 5000 will

(More...)

handle it....and that includes NTSC direct color, hetrodyne color under, RS-170 monochrome or RS-330 industrial sync monochrome.

The 5000 uses binary related delay lines that are switched in or out of the signal path at line rate to eliminate time base errors generated by all VTR's. A front panel provides a delay status meter to show the average time base error.

For More Details Circle (120) on Reply Card

Videotape Editing System

The new **CMX** System/50 is a completely stand-alone video tape editing center that occupies less than 26 square feet of floor space. The only additional equipment needed to turn a room into a complete video tape editing center is a chair and a 110v electrical outlet.

System/50 is an easy-to-learn, simple-to-operate system which allows the editor complete control of the video tape medium. It uses a minicomputer to simplify control of recorders and video switching equipment, yet System/50 is priced significantly lower than previous computerized editing systems. One configuration is below $40,000.

Source material is standard videocassettes. Edited worktapes may be either videocassette or 1" IVC.

For More Details Circle (121) on Reply Card

Op Amps

(*Continued from page 60*)

proach, however, is that in covering such a broad scope you just can't focus a great deal of attention on any one area. If there are any hotbeds of interest I've missed, or that you feel need amplification, let's hear about them. Maybe our editor will consent to a more detailed look-see sometime in future months.

In the meantime, arm yourself with catalogs and data sheets, and have fun making IC op amps go to work for you. ❑

References

1) Walter G. Jung, "The Pitfalls of the General Purpose IC Operational Amplifier as Applied to Audio Signal Processing" Journal of the Audio Engineering Society, November 1973.

2) Walter G. Jung, "New IC Approach to Audio Power" BE, October 1972.

Correction Notice

We thought we had this series completed without a hitch, but looking back we spotted a diode problem in Figure 2b, page 26 of the March issue. Note the two IN914 diodes. They should be wired back to back.

PROFESSIONAL SERVICES

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

RALPH E. EVANS ASSOCIATES
Consulting TeleCommunications Engineers
AM-FM-TV-CATV-ITFS
3500 North Sherman Boulevard
MILWAUKEE, WISCONSIN 53216
PHONE: (414) 442-4210 Member AFCCE

SMITH and POWSTENKO
Broadcasting and Telecommunications Consultants
2000 N Street, N. W.
Washington, D. C. 20036
(202) 293-7742

Joseph & Donna ROIZEN
VIDEO CONSULTANTS
International TV Systems
Marketing/Technical Writing
1429 San Marcos Circle
Mountain View, CA 94043
(415) 326-6103/967-1263

Applied Video Electronics, Inc.
STUDIO SYSTEMS DESIGN AND INSTALLATION ENGINEERING. REFURBISHING/MODIFYING COLOR CAMERAS AND QUADRUPLEX VIDEO TAPE RECORDERS.
Post Office Box 25
Brunswick, Ohio 44212
Phone [216] 225-4443

ROSNER TELEVISION SYSTEMS
CONSULTING & ENGINEERING
250 West 57th Street
New York, New York 10019
(212) 246-3967

SESCO, Inc.
47 NICHOLS AVENUE
P. O. BOX 518
(206) 378-2137
FRIDAY HARBOR, WASHINGTON, 98250

MAXIMIZE YOUR MARKET EXPOSURE
Reach over 30,000 broadcasting prospects by displaying your professional card here.

CLASSIFIED

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

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

Minimum classified charge, $2.00.

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

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

WANTED

WANTED: All surplus broadcast equipment especially clean A.M. & F.M. transmitters, contractors, capacitors. Surpluss Equipment Sales, 2 Thorncliffe Pk. Dr. Unit 28 Toronto 17, Ont; Canada. 1-73-tf

TUBES WANTED—All types-CeCo 2115 Avenue X, Brooklyn, N.Y. 11235, 212-646-6300-Anytime. 7-73-12X

WANTED: Used Pultec program equalizer either EQP-1A3 or EMH-7. Must be mint condition. Send details to KKJO Box 166, St. Joseph, Mo. 64502. 5-74-1t

WANTED—Used, working or non-working Gates BFE-10C 10 watt F.M. transmitter. Please contact G. Petersen, 161 East Goebel Drive, Lombard, Illinois 60148 5-74-1t

TAX DEDUCTABLE donations wanted. All types of audio equipment (patch panels, ATC's, equipment racks, etc.) needed. Will pay shipping costs. Contact: David Wall, % Merrimon Avenue Baptist Church, Sound Control System, Asheville, North Carolina, 28801. 5-74-1t

EQUIPMENT FOR SALE

MOTORS FOR SPOTMASTERS
NEW Paps hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price $39.00 each prepaid, while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.
TAPECASTER TCM, INC., Box 662,
Rockville, Maryland 20851
1-72-TF

ONE STOP for all your professional audio requirements. Bottom line oriented. F. T. C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32505. 7-71-tf

HELIAX-STYROFLEX. Large stock—bargain prices—tested and certified. Write for price and stock lists. Sierra Western Electric, Box 23872, Oakland, Calif. 94623. Telephone (415) 832-3527. 1-73-tf

NATIONAL TAPE CARTRIDGE SERVICE SPECIAL Pressure Sensitive Labels. Fits All Cartridges. Comes in 5 Colors. Write for FREE Sample. MASTERTONE COMPANY, 1105 Maple West Des Moines, Iowa 50265 515-274-2551 8-73-tf

RAZOR BLADES, Single Edge, Tape Editing, $17/M. 25884 Highland, Cleveland, Ohio 44143. 4-74-9t

NATIONAL TAPE CARTRIDGE SERVICE CARTRIDGES RECONDITIONED - NEW TAPE 12 Years Experienced Personnel. Write for new and reconditioned price sheet. Mastertone Co., 1105 Maple, Dept. B-E 1, West Des Moines, Iowa 515-274-2551 8-73-tf

EQUIPMENT FOR SALE CONT

"PARTS — for SPOTMASTER cartridge units. IN STOCK — IMMEDIATE DELIVERY, overnight to PA, NY, & NJ. COMMUNICATION MEDIAS, Box 54, Allentown, PA 18105 (215)-437-0607 or 437-9447. 10-73-12t

CARTRIDGE TAPE EQUIPMENT—Rebuilt. New paint, heads, flywheel, pressure roller, belts, etc. Spotlessly clean and thoroughly tested. 30 day money-back guarantee, 90 day warranty. Also contact us for discounts on new equipment and accessories. AUTODYNE, Box 1004, Rockville, Maryland 20850. (301/762-7626). 7-72-tf

MOTOROLA MICROWAVE Freq. 7.1-8.4 GHz. Broadband for color TV Xmission. Xmitter freq. deviation ±3 MHz at 60 Hz-5 MHz. Revr video response ±0.5db from 50 Hz to 5 MHz. Xmtr Bay $750 ea., Revr Bay $750 ea. Radio Research Instrument Co., Inc. 3 Quincy St., Norwalk, Conn. 06850, Tel. 203-853-2600. 1-74-tf

FOR SALE: 250 watt RCA AM transmitter, type BTA-250M, excellent condition. Available May 15. Price $2,500. 314-546-7473. Also for sale: 4 Gates Cartridge II cartridge play back machines and 1 Gates Cartridge Tape II recorder/play back machine & approximately 250 cartridges tapes loaded at various lengths. Price $200 each for the play backs and $250 for the recorder play back and $1 each for the cartridges. Phone 314-546-7473.5-74-3t

ONE AND A HALF year old IGM automation equipment. Original cost $37,500. Sacrifice price. KFIL, Box 377, Preston, Min. 55965 (507) 765-3856 5-74-1t

BUILD YOUR OWN TV AND RADIO PRODUCTION EQUIPMENT. Easy, inexpensive, (mostly IC). Plans or kits: Special Effects Generator, Automatic Logger, Vertical Interval Video Switcher, Solid State Lighting Board, Preset Audio-Video Board, Preset Lighting Board, Crystal Controlled Wireless Mikes with matching receivers, Subsonic Tone Control for audio tapes, 8MM SOF Cameras and Projectors, Distribution Amplifiers (Sync, Video, Audio), Audio Control Boards (Studio & Remote) Proc-Amp with compensation and regeneration for adapting Helical Scan VTR's to broadcast standards. PLUS specialized correspondence courses in Telephone Engineering ($39.50), and Integrated Circuit Engineering ($49.50). Plans from $5.95 to $15. SUPER CATALOG plus years updateing of new devices Air Mailed $1.00. Don Britton Enterprises, PO Drawer G, Waikiki, Ha. 96815. 5-74-24t

FOR SALE: apox. 37 ft. HJ750A Heliax New, $175.00, you pay shipping. KEMT LaGrande Ore. (503-963-8531) 5-74-1t

TWO 3M PROFESSIONAL audio record playback tape recorders, Series 410, complete within console cabinets. Purchased new February 1973. Record heads like new. $2,900.00 each, f.o.b. Fresno, California. Phone: KKNU (209) 485-7272 5-74-3t

FOR SALE: CATV LOCAL ORIGINATION TELEVISION EQUIPMENT CONSISTING OF A PANASONIC MINI STUDIO, QUICK-SET TRIPOD ASSEMBLYS, PANASONIC BLACK & WHITE CAMERAS MODEL WV-360P, SONY PORTA PACK TAPE RECORDER, PANASONIC 3110 VIDEO TAPE PLAYER, PANASONIC 3120 VIDEO TAPE PLAYER-RECORDER AND ONE PANASONIC 3130 VIDEO TAPE PLAYER-RECORDER PLUS MUCH MORE. CALL BOB INGSTAD AT KGFX RADIO 605-224-8686 OR WRITE KGFX RADIO, BOX 1197, PIERRE S. DAK. 57501. 5-74-1t

CLASSIFIEDS CONTINUED ON NEXT PAGE...

SERVICES

BROADCAST CRYSTALS: Frequency change, repair or replacement of oven types; also new vacuum types. A wise engineer keeps a dependable spare crystal handy; if you don't have one contact us. Repair and recalibration service for AM and FM frequency monitors. 30 years in business! Eidson Electronic Co., Box 96, Temple, Texas 76501. Pho. 817-773-3901. 1-74-tf

TOWER MAINTENANCE: erection, painting, maintenance and strobe lighting. Anywhere eastern USA. Triangle Towers & Antennas. P.O. Box 705 Louisburg, N.C. 27549 919-496-2934 2-74-4t

FREQUENCY MEASURING SERVICE—WE'RE #2—MONITOR REPAIRS—MOBILE UNIT— covers Northern 2/3 Ill., Eastern Iowa, Eastern Minn., Southern 2/3 Wis., Western Mich., and Western Ind., monthly. Radio Aids, 528 Ravine Ave., Lake Bluff, Illinois 60044, (312) 234-0953. 2-74-tf

MONITOR SERVICE: Despite relaxed rules, a good reliable frequency monitor is still the station engineers best friend. Dependable monitors for sale or we will service and recalibrate yours. Eidson Electronic Co., Box 96, Temple Texas, 76501. Pho. 817-773-3901. 5-74-tf

HELP WANTED

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

TV MAINTENANCE ENGINEERS with four years current TV broadcast experience. Must be capable of training local personnel. Thorough maintenance background with system design and installation experience desired. Two year contract with relocation, housing, and medical services furnished. Send resume to: Chief Engineer KVZK-TV, Pago Pago, American Samoa 96799. 4-74-3t

TV TECHNICIAN/ENGINEER — 2 OPENINGS FOR A UHF TV STATION IN THE SOUTHEAST FOR OPERATION AND MAINTENANCE OF VTR 2000'S. FIRST PHONE LICENSE REQUIRED. SEND REPLIES TO P.O. BOX 3693, MIAMI, FLORIDA 33169. 5-74-1t

DIRECTOR OF MEDIA PRODUCTION. Central NJ Community College is seeking individual experienced in automated audio and visual distribution systems with background in ITFS Programming. Must have production and management experience in video, graphics, photography, cinematography, audio and visual recording. Respond in confidence with full particulars including salary requirements to: Box #301. Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. An Equal Opportunity/Affirmative Action Employer 5-74-1t

DIRECTOR DEPARTMENT OF COMMUNICATION SERVICES, The University of Kansas Medical Center College of Health Sciences and Hospital Kansas City, Kansas. The Director of this department will have suitable qualifications, probably masters or a doctorate, experience in an area or areas of communications, and a background in education to make desirable a joint appointment in an additional department of this university medical center. The Director will manage and lead the Department of Communication Services and its 34 employees in the divisions of television, photography, cinematography, design and illustration; and audiovisual materials library. Production of instructional and learning materials, consultation and work with faculty and academic departments, and pursuit of personal scholarly and creative efforts will be presumed. The University of Kansas Medical Center is an equal opportunity employer. Contact: F. F. Holmes, M.D., University of Kansas Medical Center, Kansas City, Kansas 66103.5-74-1t

HELP WANTED (CONT.)

TV ENGINEER II: Unusual opportunity for progressive engineer to work within creative facility. PBS affiliate in Southwest's fastest growing market. First Class FCC License and maintenance experience required. Salary range $10,524 to $12,779. Send resume of training and experience by Friday, May 10, 1974, to Clark County School District, Classified Personnel Department, 2832 East Flamingo, Las Vegas, NV 89121. Equal Opportunity Employer. 5-74-1t

TRAINING

PASS FCC first and second class exams with new 21 lesson, 450-page course. Starts with basic electricity. Over 600 FCC-type, multiple-choice questions and sample exams included. No previous technical knowledge required. Commercial Radio Operator Theory Course, #15-01. Only $5.95. Ameco Publishing, 314G Hillside Ave., Williston Park, N.Y. 11596. 8-72-tf

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

PASS FCC EXAMS with Ameco books. Each book contains FCC questions plus simplified answers plus FCC-type exams and answers. 3rd class 90c, 2nd class $2.25, 1st class $1.50. Free catalog. Ameco Publishing, 314G Hillside Ave., Williston Park, N.Y. 11596. 8-72-tf

EARN YOUR ELECTRONICS DEGREE by correspondence. G. I. Bill approved. For free brochure, write Grantham School of Engineering Information Desk, 2000 Stoner Avenue, Los Angeles, Calif. 90025. 8-72-tf

advertisers' index

10 Stepping Stones to a Better Job in Broadcasting

2 new and 8 recently revised texts from Sams.

TELEVISION BROADCASTING:
Tape and Disc Recording Systems
By Harold E. Ennes

Provides fundamental knowledge of the primary functions of video-tape equipment for beginners as well as practicing engineers. Contains valuable information on: basic concepts; quadruplex head; video and fm system; servo system; tape drop-out and compensation system; advanced color-error correction system. Also covered: splicing and editing; tape operation and maintenance; video disc recording systems. 576 pages, hard cover.
No. 20933 $14.95

TELEVISION BROADCASTING:
Equipment, Systems, and Operating Fundamentals
By Harold E. Ennes

This comprehensive, new reference volume for practicing technical personnel and student TV technicians and operators covers the NTSC color system, camera chains, sync generators, signal distribution, recording systems, studio lighting, studio equipment operation, microwave relay systems, antennas, transmitters, and operating procedures. 656 pages, hard cover.
No. 20786 $14.95

TELEVISION BROADCASTING:
Camera Chains
By Harold E. Ennes

Authoritatively provides the fundamentals necessary for more efficient assimilation of modern instructional books. The overall "system" concept is used to discuss studio lighting, camera mounting, interconnection facilities, power supplies, video amplifiers, video processing, camera control, set-up circuitry, and more. 464 pages, hard cover.
No. 20833 $12.95

TELEVISION BROADCASTING:
Systems Maintenance
By Harold E. Ennes

A thorough and detailed treatment of television broadcasting systems maintenance, covering every maintenance phase. Tests, measurements, and analysis of malfunctions of all portions of the broadcast installation are covered and illustrated. Question and answer reviews for each chapter. 608 pages, hard cover.
No. 20898 $14.95

WORKSHOP IN SOLID STATE
By Harold E. Ennes

An outstanding training text, complete with exercises at the end of each section (answers in back of book). Provides the engineer-technician trained in vacuum-tube circuitry with a rapid, practical and effective transition to the mastery of solid-state circuitry in all broadcast applications. 384 pages, hard cover.
No. 20735 $9.95

VIDEO TAPE RECORDERS
By Harry Kybett

This comprehensive guide for those who operate or service helical video tape recorders supplies information that is missing from many service manuals for specific models. It explains v.t.r. fundamentals and basic problems, and outlines solutions. Coverage includes: electronic circuits; quad-head v.t.r.'s; color recordings; portable v.t.r.; cassette systems; hybrid formats; accessory equipment. 352 pages, softbound.
No. 21024 $8.95

FIRST-CLASS RADIOTELEPHONE LICENSE HANDBOOK, 3rd Edition
By Edward M. Noll

More than a question and answer book, it is also an excellent reference text on broadcast communications with a thorough coverage of theory and basic principles. It supplies all information needed to progress from a 2nd to a 1st class radiotelephone license. 416 pages, softbound.
No. 20804 $6.50

SECOND-CLASS RADIOTELEPHONE LICENSE HANDBOOK, 4th Edition
By Edward M. Noll

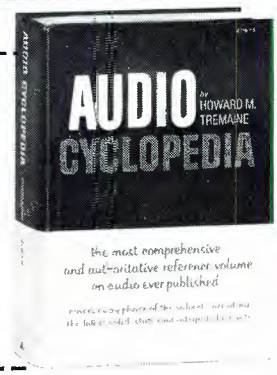
Covers all information needed to pass the 2nd class FCC radiotelephone exam, covering FCC Rules and Regulations, communications theory and practices, solid-state two-way equipment, etc. Questions and answers based on the FCC exam. 360 pages, softbound.
No. 20824 $6.50

RADIO SPECTRUM HANDBOOK
By James M. Moore

This highly informative book covers the entire usable frequency spectrum. Allocations, types of transmissions, and examples of transmitting and receiving equipment used in each band are included. 192 pages, hard cover.
No. 20772 $7.95

AUDIO CYCLOPEDIA, 2nd Edition
By Dr. Howard M. Tremaine

This best-selling reference book is the most comprehensive and authoritative work on audio available. It lists and explains 3650 entries, covering everything from the principles of basic sound to the latest in solid-state equipment. Hundreds of illustrations and schematics help make complicated topics clear. 1760 pages, hard cover.
No. 20675 $29.95



HOWARD W. SAMS & CO., INC.
4300 W. 62nd Street, Indianapolis, Indiana 46268

BE-054

Order from your Electronics Parts Distributor, or mail to Howard W. Sams & Co., Inc.

Send books checked at right. $_____ enclosed. Please include sales tax where applicable. Canadian prices slightly higher.

☐ Send FREE 1974 Sams Book Catalog.

☐ 20933 ☐ 21024
☐ 20786 ☐ 20804
☐ 20833 ☐ 20824
☐ 20898 ☐ 20772
☐ 20735 ☐ 20675

Name_____

Address_____

City_____ State_____ Zip_____

For More Details Circle (2) on Reply Card

the viewer grabber

Specializing in the field of video switching, Vital Industries offers the broadcast industry a new electronic approach to match film production techniques with graphics-generating capabilities at your fingertips. The VIX-114 series production switching systems are human-engineered for ease of operation of the control panel without interpolation of functions. Digital electronics is used throughout for superb linearity, stability and reliability.

- *Digital rotary patterns. Hard, soft or border wipe.*
- *Digital key edging. Border, shadow and outline.*
- *Digital quad split. All directions. Independent horizontal split.*
- *Digital switching controls.*
- *Vari-key. Soft, hard or see-thru key.*

12 years of specialization. Designed, manufactured and delivered some of the world's largest and most complex integrated telecommunication systems.

all digital controlled video switching systems

GOOD ENGINEERING IS VITAL

VITAL INDUSTRIES, INC.

MAIN OFFICE: 3700 N.E. 53rd Ave., Gainesville, Fla. 32601 • Phone 904/378-1581

MORRELL BEAVERS Midwest
2644 North Seventh St.
Terre Haute, Indiana 47804
Phone 812/466-3212

ROBERT McALL Northeast
34 Autumn Lane
Hicksville, N.Y. 11801
Phone 516/735-0055

ERIC KING Southeast
3620 Ridgewood, Rd., N.W.
Atlanta, Ga. 30327
Phone 404/233-9450

ERIC KING
Fox Hill Road
Lynchburg, Va. 24503
Phone 804/384-7001

WEST COAST
7960 West Beverly Blvd.
Los Angeles, California 90048
Phone 213/653-9438

For More Details Circle (3) on Reply Card