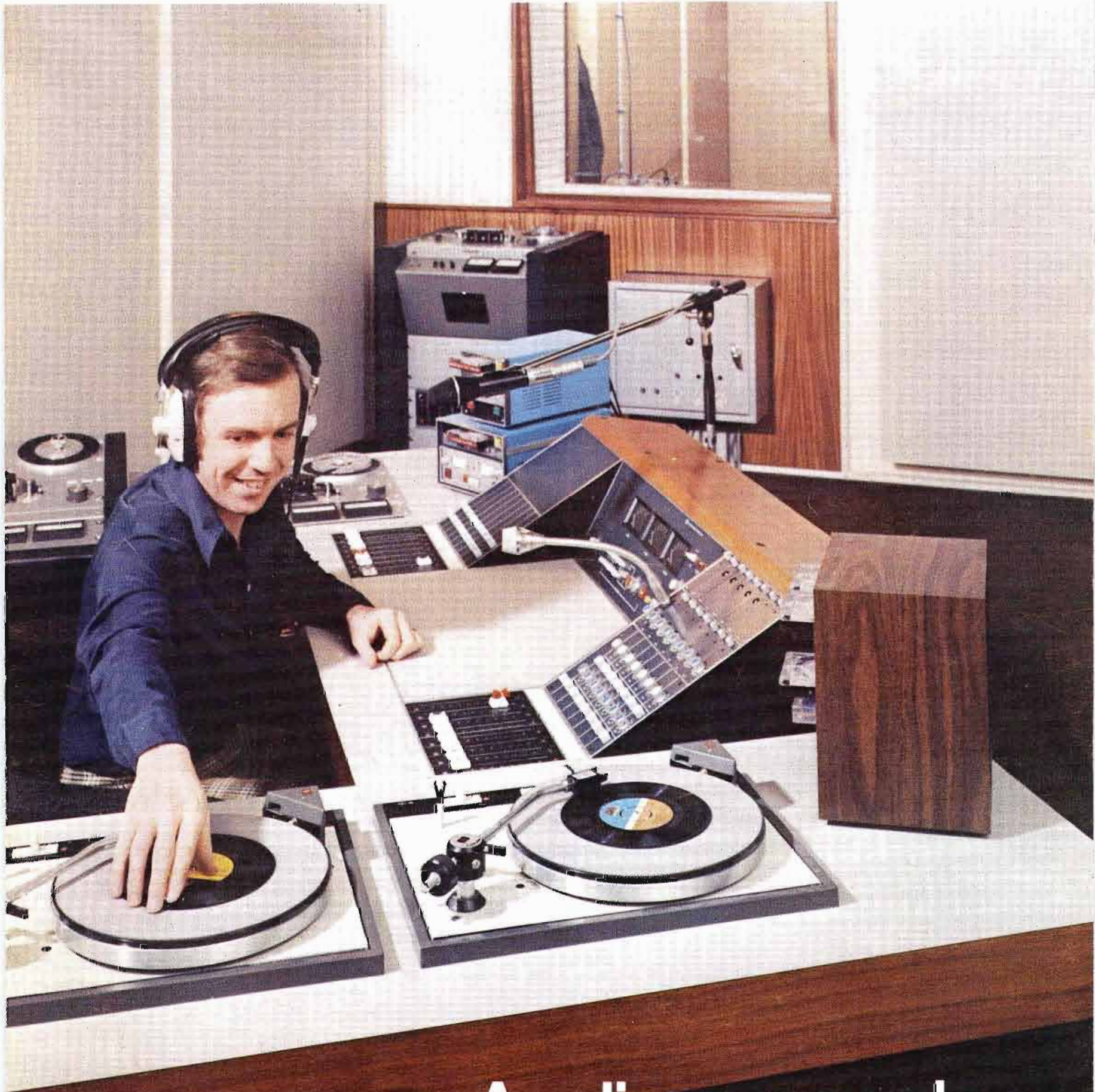


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# BROADCAST **engineering**

December, 1974/75 cents



Audio console  
roundup page 17



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# BROADCAST **ENGINEERING**®

The technical journal of the broadcast-communications industry

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### About the Cover

The cover shows a sportscaster at Picadilly Radio, England, using one of the newest type consoles. See our console roundup on page 17. Photo, courtesy of Rupert Neve.

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**CARL BABCOKE**, Technical  
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**HOWARD T. HEAD**, FCC Rules  
**ROBERT A. JONES**, Facilities  
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**BROADCAST ENGINEERING** is published monthly by Intertec Publishing Corp., 1014 Wyandotte Street, Kansas City, Missouri 64105. Telephone: 913 888-4864.

**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**, Publisher  
**INTERTEC PUBLISHING CORP.**  
 Subsidiary of **HOWARD W. SAMS & CO., INC.**



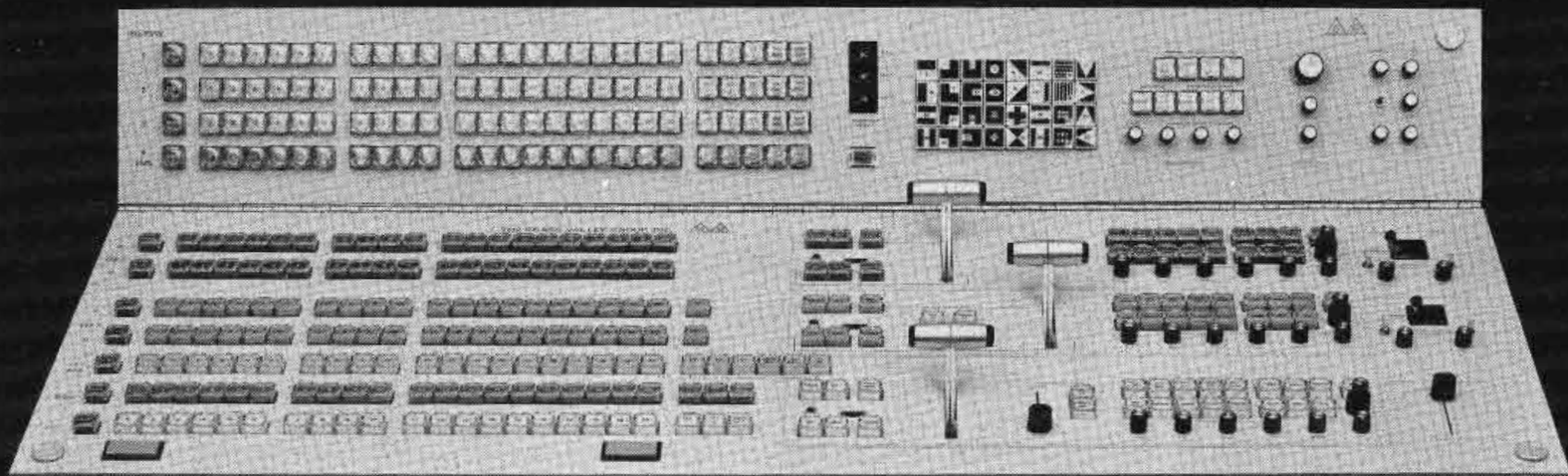
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# DIRECT CURRENT FROM D. C.

December, 1974

by Howard T. Head

## Federal Pre-Emption of CATV Technical Standards

The Commission has announced a broad Federal pre-emption of Cable TV Technical Standards. Effective January 1, 1975, the Commission will not issue a certificate of compliance for a cable system based on an application which includes technical standards different from or in addition to the FCC's own standards.

In announcing this pre-emption, the Commission has made it plain that it is concerned only with such matters as the shaping, amplification, attenuation, purity, etc., of the signals carried on cable television systems. These matters are covered by Subpart K of Part 76 of the Commission's Rules and Regulations.

The pre-emption will not apply to cable systems now in operation, or authorized prior to the effective date of January 1, 1975. However, in those cases, the Commission's order provides that existing system operators may seek special relief in appropriate cases. Likewise, waivers may be sought for the granting of certificates of compliance after the effective date which include Technical Standards extending beyond those contained in the Commission's Rules.

The Commission's Notice makes it plain that it intends to rely heavily on the report to the Commission of the Cable TV Technical Advisory Committee (CTAC), which is scheduled for completion in early 1975. Of particular concern to the Commission is a resolution of the dilemma confronting systems providing local originations, who may find compliance with locally-imposed standards quite expensive, or the equally unpleasant alternative of the waveform instability of inexpensive equipment so poor as to prevent adequate reception on many home receivers.

## Tests on TV Circular Polarization Reported

The American Broadcasting Company (ABC) has filed a preliminary report with the Commission on tests of circularly-polarized transmissions for television. These tests were conducted using ABC's O&O WLS-TV, Chicago, operating on Channel 7 (174-180 MHz).

The experimental transmissions took place using a special transmitting antenna on top of the newly completed Sears Building in Chicago. Provision was made for transmission either with horizontal polarization or with right-hand circular polarization. Field strength measurements and picture quality observations were made both in the city of Chicago and along a radial route extending

*(Continued on page 6)*

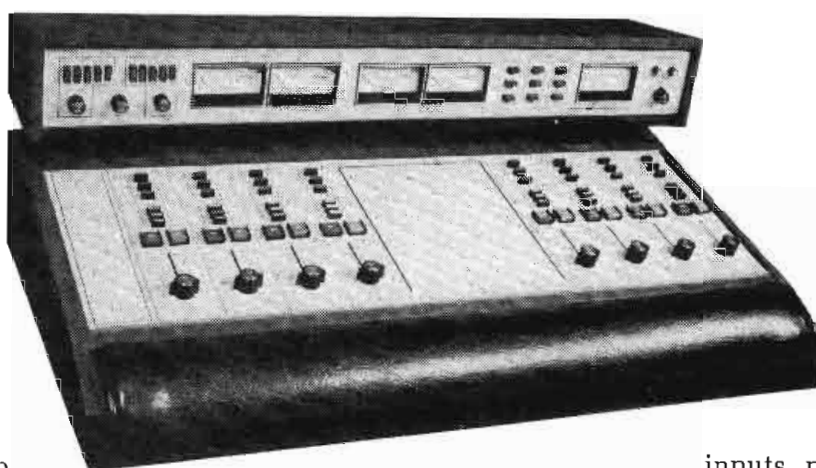


# It pays to read more than the name on the front.

There's that old saying about judging a book by its cover. The name does not always indicate the quality inside. The same theory holds true for just about any piece of equipment, typewriters, fleetcars or radio broadcast equipment.

To illustrate this point, we have prepared a list of comparisons based on current published data from the five leading manufacturers of stereo audio consoles.

We want you to examine all manufacturers' audio equipment claims. Inquire. Compare. Read the facts, the whole story . . . carefully. Make up your own mind. We feel that only when you have fully evaluated all equipment claims factually, are your best interests served. And ours.



Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	SPARTA Centurion II
No. of Std. Program Busses	2	2	2S & Metered Mono	2	3S & Metered Mono

Only the SPARTA CENTURION II gives you three stereo program busses, plus metered monaural output.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	SPARTA Centurion II
No. of Input Mixers	8	10	10	6 - 10	8 - 12

Only the SPARTA CENTURION II gives you from eight to twelve mixers in the basic console. With extender options for eighteen or twenty-four mixers.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	SPARTA Centurion II
No. of Input Sources	18 (4M)	20	28	18 - 30	24 to 36, 54 and 72
Input Level Selection	Set 3 Lo 15 Hi	Optional Cards	Selectable Hi-Lo	Optional Modules	Switch Hi-Med-Lo

Only the SPARTA CENTURION II gives you three

inputs per mixer module in every configuration. And every one is switch selectable for high, medium or low level inputs.

Manufacturer & Model	GATES Stereo 80	CCA 10S	COLLINS IC-10	SPOT-MASTER BESL-1006	SPARTA Centurion II
Mixer Expanders Available	No	No	No	No	Yes

Only the SPARTA CENTURION II gives you the availability of mixer extender options.

Other SPARTA CENTURION II features include: remote turning on/off of all mixers; remote start capability through the mixers; motherboard construction with ground plane PC techniques for elimination of wiring harness; silent operation; audio-follow-video switching; fully interchangeable mixing modules; only three types of amplifiers throughout; optically isolated audio switching; either slide or rotary attenuators as options, at the same price; 25 Watts per channel monitor amplification; five VU meters as standard equipment.

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generally to the west beyond the predicted Grade B coverage contour.

The principal advantage noted by the ABC report was an improvement in ghosting at various locations in the heavily built-up area, although a circularly-polarized receiving antenna was required to enjoy this improvement. Little effect was noted in the more distant fields, although an additional 3 dB of power should be available at any location employing a circularly-polarized receiving antenna.

ABC plans to petition the Commission shortly to permit this mode of operation on a regular, voluntary basis. Commission staffers are generally pleased with the outcome of the tests. ABC plans further testing in the hope of resolving various questions which were not answered in the preliminary report.

#### Federal Control Over Receiver Performance?

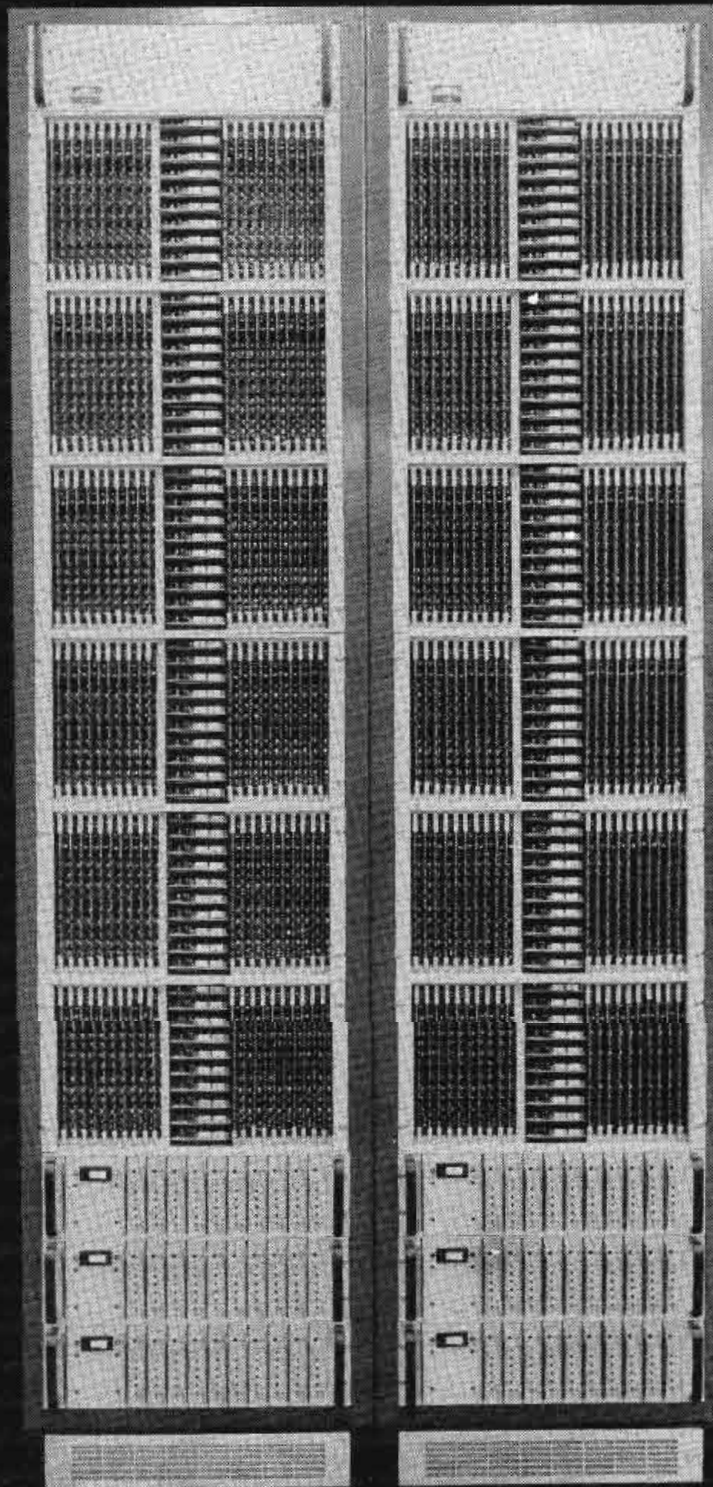
We reported in Direct Current for August 1974 a Commission proposal to establish minimum performance requirements for certain shipboard receivers. In a recent address to a meeting of the IEEE Broadcast Symposium in Washington, FCC Chief Engineer Ray Spence, noting that recent tests at the FCC Laboratories have shown many instances of relatively poor UHF TV receiver performance, expressed the view that Federal control over TV receiver performance might be necessary to improve the situation.

The only performance requirement presently imposed on TV receivers has to do with receiver noise figures, and permits a noise figure at UHF as high as 18 dB above  $kT\Delta F$ . Apparently new legislation would be required to extend further FCC control over TV receiver performance. It is likely that the Commission will seek such legislation if necessary, and in today's climate in Washington it might have a good chance of passage.

#### Short Circuits

The Commission has authorized 36 television translators in Alaska along the route of the Alaska Oil Pipeline to program directly from video tape . . . The Commission in its reregulation program has revised more of the Broadcast Rules and Regulations . . . The Commission has dismissed an application for an AM station in Puerto Rico because of excessive interference expected to be received from a station in the British Virgin Islands. Although the U.S. has no separate treaty, the interference would have affected 94% of the population in the Puerto Rican station's 0.5 mV/m contour . . . The Commission has adopted rules permitting the use of extension meters on broadcast transmitters (see Feb. 1974 D.C.) . . . Presunrise operation under relaxed rules went out of effect with the return to standard time on October 27, and will remain so until February 23, 1975 . . . The Commission's Fairness Bureau has rejected a complaint against a station which editorialized favorably with respect to the National Organization for Women (NOW) filed by Happiness of Womanhood, Inc. (HOW).





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## INDUSTRY NEWS

### NAFMB National Convention Was A Success

Exceptional response from registrants, exhibitors, and hospitality suite hosts alike created a very positive atmosphere for the very successful National Radio Broadcasters Conference & Exposition, held October 10th through 13th in New Orleans.

About one thousand people were on hand at the NAFMB-sponsored, first-time national radio meeting, which featured about seventy-five exhibits and hospitality suites. Both attendance figures and exhibitor/hospitality suite response is reported to have exceeded all totals anticipated by the Association.

Informal workshop sessions on such vital topics as "Sales—The Name of the Game," "Problems and Answers for Radio Broadcasters," and "Promotion that Produces and Pays" were greeted with enthusiasm by the hundreds of FM and AM broadcasters who attended these panel discussions on October 10th, 11th and 12th. Experts also discussed management, community service, programming, news, and the creative side of radio with the registrants.

Friday afternoon, Oct. 11th, was highlighted by the appearance of FCC Commissioner James H. Quello as a special guest speaker at the Armstrong Awards Luncheon. Following lunch, Commissioner Quello, several members of the FCC staff, and prominent communications attorneys discussed "The Broadcaster, the FCC, and the Law" with the radio broadcasters.

Kevin P. Reilly, a member of the State House of Representatives of the state of Louisiana, was the featured speaker at the Thurs., Oct. 10th, luncheon and keynote speakers on Oct. 10th, 11th and 12th were Jack G. Thayer, Pres. of NBC Radio, George Duncan, Pres. of Metromedia Radio, and Edward Little, Pres. of the Mutual Radio Networks.





## FM's Approved For Highway Information

The Federal Highway Administration has announced that FM stations can be included with AM stations on signs to be erected along the nation's highways to provide a source of weather and highway information.

Last July, the National Advisory Committee recommended to the FHA that such signs be permitted, but FM stations were not included.

In a letter to Robert E. Conner, chief of FHA's Traffic Control Systems Division, Charles T. Jones, Jr., vice president and director of the Radio Information Office of the National Association of Broadcasters, urged the FHA to reconsider the exclusion of FM.

He pointed out that "more and more car radios have both AM and FM capability and it seems unnecessary to suggest that those motorists already listening to FM switch to the AM band."

After reviewing the Advisory Committee's recommendations, the FHA decided to permit the inclusion of FM stations meeting its criteria.

## Foster Asks For Pay TV Progress

The chief spokesman for the cable television industry urged the Federal Communications Commission to abolish arbitrary restrictions on the presentation of movies and series programming on pay cable television and to give pay cable operators the right to carry sports programs not presently available on commercial television.

David H. Foster, President of the National Cable Television Association and lead-off witness for the cable television industry at three days of hearings before the FCC on pay cable, told the Commission: "Instead of attempting to spin a Byzantine web of restrictive pay cable regulations designed to compromise competing 'political' interests, this Commission ought to return to basics now. Only a

regulatory scheme founded on competition and marketplace forces will truly promote the objectives of the Communications Act."

Foster also urged the FCC to halt the practice of commercial networks denying pay cable access to feature films through "warehousing". "Using their awesome economic leverage and monopoly position, television networks have been able to thwart pay cable access to feature films even under the present restrictive rules through

contractual exclusivity with program producers," he charged.

Foster criticized the networks and television broadcasters for their shrill advertising and lobbying campaign to halt pay cable development.

Foster told the FCC commissioners, "...in most other areas subject to your jurisdiction—and despite heavy pressure from established interests—the FCC has taken the lead in promoting competition in communications services."

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# NAB-RAB Boost Radio Plans

A liaison committee of the National Association of Broadcasters and the Radio Advertising Bureau has developed plans for cooperative efforts the two organizations can undertake to benefit radio's economy and also explored the possibility of coordinating some NAB-RAB activities.

In a joint statement, Miles David, president of the Radio Advertising Bureau, and Vincent T. Wasilewski,

president of NAB, said:

"The purpose of the meeting was to find more ways in which RAB and NAB could work together to strengthen radio. We have been actively working together at the staff level for some time, exploring projects and activities that could be undertaken through collaborative action. During its first meeting, the committee, which consists of members of the RAB and NAB

Boards of Directors, examined a number of issues that can be jointly dealt with to the benefit of all radio broadcasters. We believe that future meetings of the committee will bear fruit for radio in the areas of sales, legislative representation and business and program operations."

Among the specific issues discussed were: ways to eliminate roadblocks and increase cooperative advertising by manufacturers in radio, the possibility of joint ventures such as combined NAB-RAB regional meetings, increased RAB participation in the planning and presentation of radio sessions during the NAB national convention, methods of securing a fair share for radio of advertising revenues spent by various government agencies and organizations.

Present at the meeting in addition to Wasilewski and David were: Andrew M. Ockershausen, vice president, Washington Star Stations, Washington, D.C., chairman of the NAB Board of Directors; George Comte, president, WTMJ-TV, Milwaukee, Wisconsin; Charles Dickoff, president, WEAQ, Eau Claire, Wisconsin; Bruce Johnson, president-radio, RKO General, Inc., Los Angeles, California; Harold Krelstein, chairman of the board, Plough Broadcasting Company, Inc., Memphis, Tennessee; Harold Neal, Jr., president, ABC Radio, New York, New York; Donald Pels, president, Lin Broadcasting Corp., New York, New York; Robert Alter, executive vice president, Radio Advertising Bureau, New York, New York; Grover Cobb, senior executive vice president, NAB; James Hulbert, executive vice president for public relations, NAB, and Burns Nugent, executive vice president for station relations.

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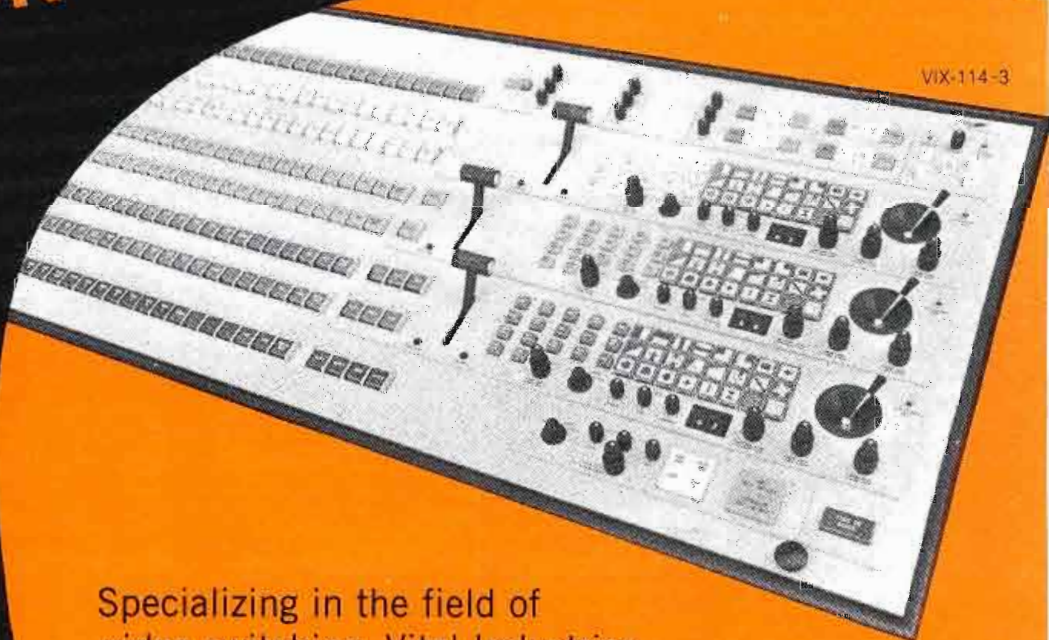
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## SBE Fellows

In the short, 10-year history of the Society of Broadcast Engineers, Inc., a number of members have been advanced to the grade of Fellow. The Fellow grade is conferred on those who have rendered conspicuous service or who have given signal service to the Society. A member cannot apply for the Fellow grade but must be nominated by other members and be approved by the SBE Board of Directors.

In each of the next several issues of **Broadcast Engineering**, as in the previous five issues, with the cooperation of the publisher, we will cover the accomplishments and qualifications of one of the SBE Fellows. In previous issues we have so honored Robert Flanders, Charles Hallinan, Harold E. Ennes, Albert H. Chismark, and Benjamin Wolfe. In this issue we have selected Leo W. Reetz.

Leo W. Reetz is one of the earliest members of the Society of Broadcast Engineers. During his first term as a Director of the SBE he was an active participant in the drafting of the Articles of Incorporation and the By-Laws of the Society, and served on the SBE Admissions Committee from 1964 to 1973. He held the committee chairmanship from 1966 through 1973. He served two consecutive terms and an additional term as Director of the Society. He was the first Chairman of Chapter 15 of the SBE in New York City.

Mr. Reetz was born in Oakland, Oregon. During World War II he served as a travelling troubleshooter for the Army Airways Communication System in the North Africa Theatre. He has a BS from Oregon State University. Among the positions he has held are Chief Engineer KNPT, Newport, Oregon; KRXL Roseburg, Oregon; KEZI-TV, Eugene, Oregon; and KCRG-TV Cedar Rapids, Iowa. He is currently Chairman of the Engineering Sub-Committee of the TV All Industry Committee in New York City for the Installation of the TV facilities in the World Trade Center; and also Chairman of the Engineering Committee and the Antenna Com-

mittee of Sutro Tower, Inc. for development and installation of Sutro Tower in San Francisco.

His present position, which he has held for nearly 10 years, is R. F. and Allocations Engineer for the American Broadcasting Companies, Inc.

## Chapters In The Making

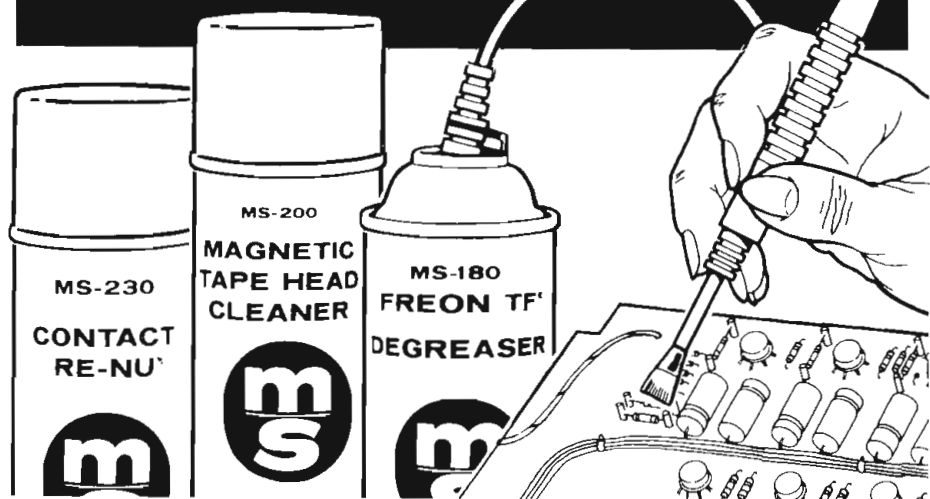
A listing of possible future chapters is provided here. To learn of planned meeting dates, times, and locations, contact the person listed for that particular area. Those interested in establishing chapters in additional locations, contact Ms. Virginia Doss, Asst. Secretary-Treasurer, SBE, P.O. Box 88123, Indianapolis, Ind. 46208. Additional assistance may be obtained through SBE President James C. Wulliman, Manager, Engineering, WTMJ, Inc., Milwaukee Journal Stations, 720 East Capitol Drive, Milwaukee, Wisconsin 53201. To expedite the publication of your activities, send the information to SBE editor Joe Risse, P.O. Box 131, Dunmore, Pa. 18512.

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**Broadcast Engineering** magazine provides this means whereby the members of the Society of Broadcast Engineers can report on SBE chapter meetings, announce future events, and have articles, papers, and other technical and nontechnical items published.

Chapter chairmen should see that information on meetings and other news is sent promptly, as soon as it is available, to the SBE editor, Joe Risse, P.O. Box 131, Dunmore, Pa. 18512. Include photographs whenever available; preferred photograph size is 8 x 10, but smaller sizes are also usable.

Members and other interested persons are invited to submit letters to the SBE editor; the mailing address is given above.

## Chapter Meetings

### Chapter 1: Binghamton, N.Y. Chairman: W. J. Sitzman, Jr. Tyrone, N.Y. 14887

On October 11th Chapter 1, along with Chapters 2 and 22, sponsored the 2nd Annual Mini-vention at the Owego Treadway Inn, Owego, N.Y.

Larry Taylor of WENY-TV was the convention chairman and Mini-vention organizer. Nearly two dozen exhibitors participated. There were two papers presented, one by Neal McNaughten, Chief, Rules and Standards Division, Broadcast Bureau, Federal Communications Commission; the second was a seminar on Directional Antennas, by Glenn Winter, Professional Engineer.

The regular monthly meeting of Chapter 1 was held on October 8th, at the Treadway, Owego; Raymond Rayburn, Audio Consultant, Ridgewood, N.Y., spoke on "AM, FM, TV Audio – How to Make it Crystal Clear". Rayburn is a designer of audio and tape equipment, has authored a number of papers on measurements and acoustics, and is a member of the AES and the IEEE. He concentrated on IM distortion, transmitter power supply limitations on performance, and low frequency phase shift and effects on modulation capability.

Chairman Bill Sitzman, Jr., presided.

### Chapter 2: Northeastern Pa. Acting Chairman: John Kowalchik Kingston, Pa. 18740

Members met on October 7th at WVIA-TV FM studios to plan activities for the year.

The resignation of Paul Evanosky was accepted with regret, and officers

and directors expressed their gratitude for his dedication as chairman and for his work during the two years he presided. Paul assured the chapter of his continuing support.

The chapter also loses the services of Charles Morgan, secretary, who was promoted by his employer, Susquehanna Broadcasting, to Director of Radio Engineering and transferred to the corporate headquarters in York, Pa.

The presiding officer will now be John Kowalchik, vice chairman and Milan Krupa, chief engineer of WPTS, Pittston, will continue as treasurer and also act as secretary until elections are held.

The first technical session was a joint meeting with the International Society of Certified Electronic Technicians (ISCET) on November 3rd. Luncheon was followed by a seminar conducted by John J. Guinan, CET, electronics instructor, and president of the Television Service Association of Delaware Valley, on "The Spectrum Analyzer and Its Uses in Testing and Aligning Wideband Networks and Amplifiers".

The December meeting will be the Annual Christmas Party, scheduled for December 2nd, at the studios of WVIA-TV FM. Guests of the chapter are welcome. The January 6th meeting will be at WVIA with the program to be announced.

### Chapter 9: Phoenix, Ariz. Chairman: Leo Anglin Phoenix, Ariz. 85001

The September 19th meeting was held at KTVK-TV studios. Telemation was represented by Chuck Mendenhall who provided a program on video topics.

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

The chapter meeting for this month was the October 25-26 Mini-vention held at the Tarrytown, N.Y. Hilton Inn. Forty companies exhibited 100 product lines and 13 technical sessions were presented. Good attendance was reported by convention committeemen Lyn Snyder and Larry Strasser. This was by far the largest Mini-vention to date by any SBE chapter.

### Chapter 16: Seattle, Wash. Chairman: Harry Lewis Seattle, Wash. 98125

The October 9th meeting was preceded by a social hour at 11:30 AM at the Black Angus Restaurant. Stan Keck's Aero-Marc arranged with Chet Beintema of Conrac Corporation to present a program on the past, pre-



sent, and future of color phosphors in display devices. One of the questions discussed was, "What are the true colors when we view a scene on a 6000 plus degree K color monitor or receiver, when a 3050 degree K studio lighting is used and a 3200 degree K color camera system?"

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

Members and guests met on October 17th for a noon luncheon at Buddies Upstairs for a report from the committees on Mini-vention plans and how they are progressing for this November 1st event which was scheduled for the Mariott Inn, Pittsburgh. At least 12 companies had signed for exhibit space up to October 1st. Further information on this convention will be included in the next issue.

**Chapter 26: Chicago, Ill.  
Chairman: Brad Anderson  
Chicago, Ill. 60680**

The September 24th program was provided by Rank-Precision on the topic of Lenses and Prisms. D. Alan Crist, Harry Paget, and Dick Dettman covered the types of lenses available, methods of caring for lenses, and details of their construction.

**Chapter 28: Milwaukee, Wis.  
Chairman: Ed Wille  
Milwaukee, Wis.**

The October 15th meeting started with dinner at the Eastbrook and then progressed to a technical session at Radio City Auditorium, WTMJ, Inc., where Steve Fawkes, field engineer for Scully/Metrotech talked on "Audio Tape Recorder Maintenance". His experience extends over twenty years, starting from his high school days, including work in a film studio,

recording studio, and as systems designer at Batelle Memorial Institute in Columbus, Ohio. His program included setup procedures for audio tape recorders, tips on routine and emergency maintenance, and a question-and-answer session.

In the chapter newsletter, The Broadcaster, editor Todd Boettcher of WTMJ, commented that the September 24th meeting turned out to be the largest in the history of the chapter, with 120 attending.

Results of the recent election of chapter officers: Chairman, Bob Truscott of WITI-TV, who is also a member of the national SBE board of directors; Vice Chairman, Dave Dzurick, WRJN; Secretary-Treasurer, Jan Pritzl of WMVS.

**Chapter 32: Southern Ariz.  
Chairman - Hobart J. "Bart"  
Paine  
Tucson, Ariz. 85717**

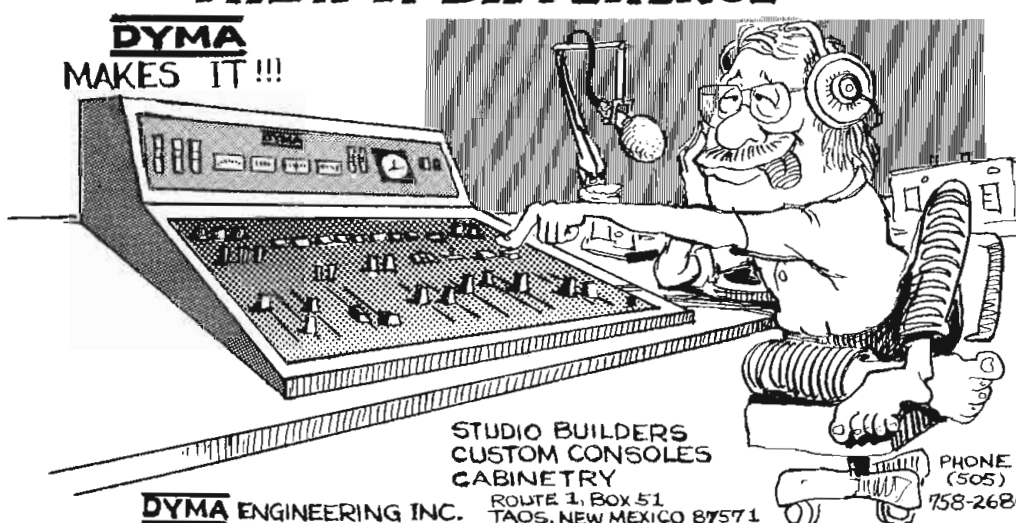
A meeting at National Radio Astronomy Observatory Labs, Tucson, was held on October 24th. SBE member Armand Sperduty arranged for Dr. Robert Ulich of NARO to talk on the 36-foot Radio Telescope. His presentation covered various topics such as Optical Research, Molecules in Space, Cygnus X-3 (which is about 33,000 light years away), and The Frequency Spectrum of 26,000 MHz to 240 GHz.

Chairman Paine observed that 5 new members marked a 700% increase in membership since organization of the chapter a year ago.

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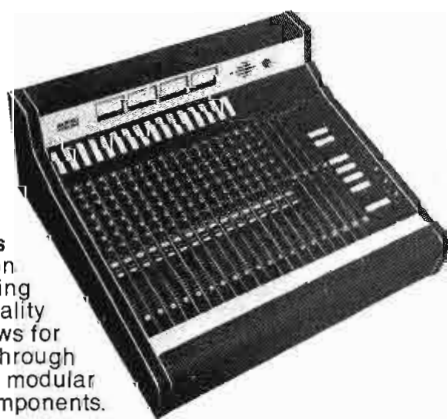
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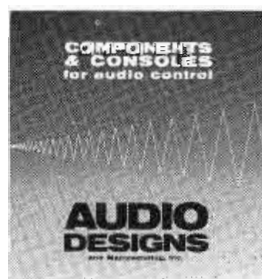
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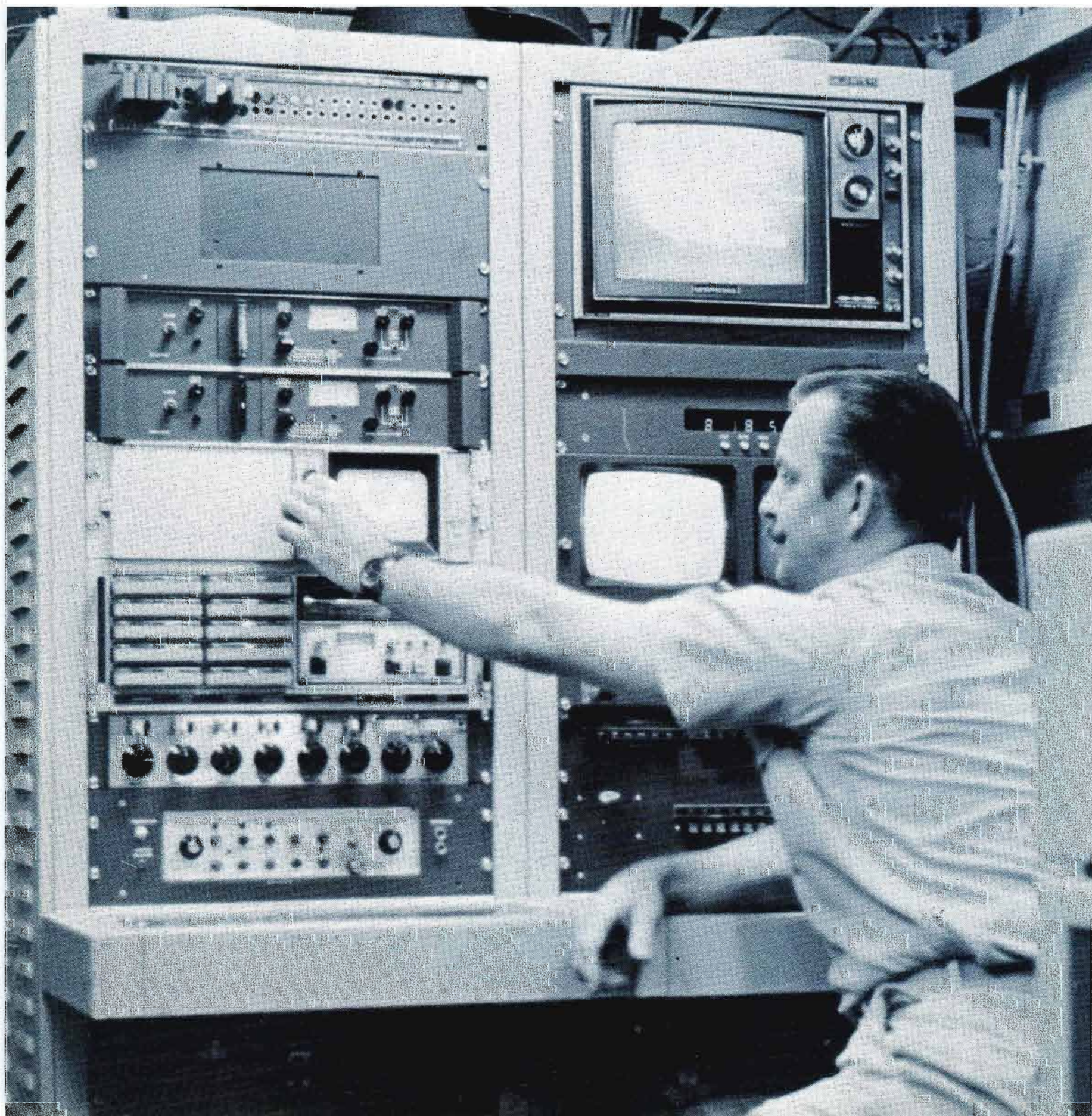
December, 1974

# CABLE engineering

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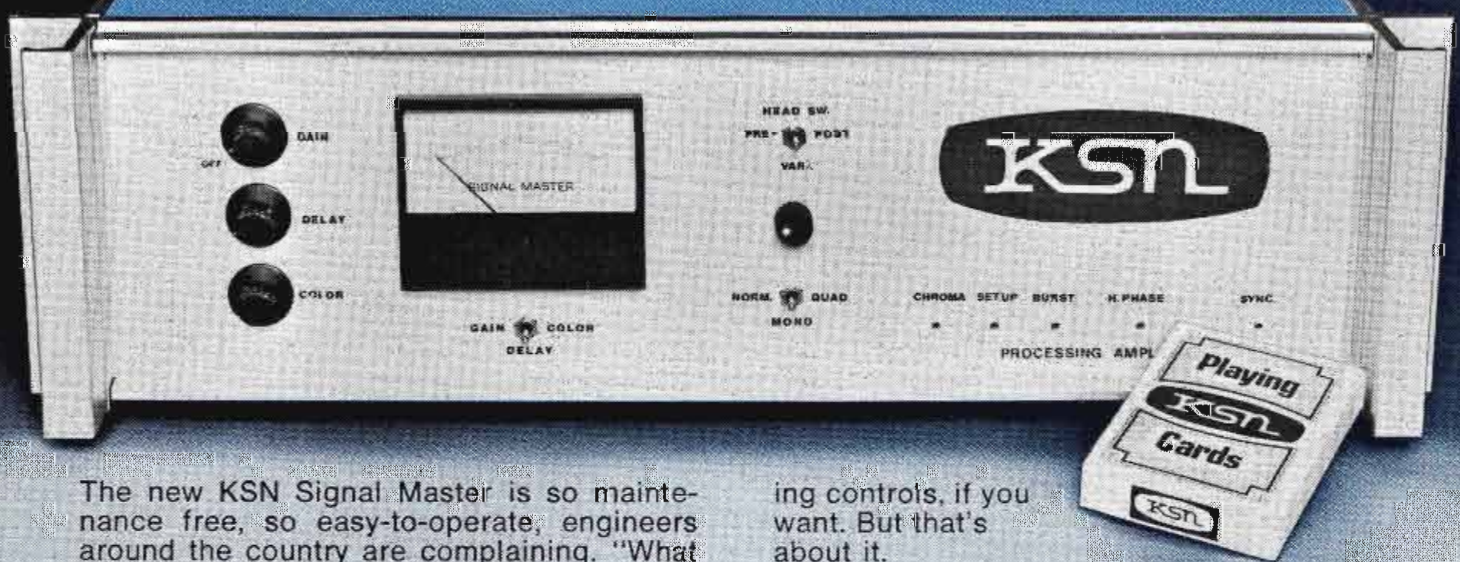
Shooting Film for TV.....CE-6





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## NAB Continues Its Anti-Pay Campaign

The National Association of Broadcasters has opposed strongly suggestions by pay cable interests that the Federal Communications Commission suspend in a four-year "experiment" its rules against the siphoning of free TV programming by pay cable systems.

NAB said the proposal is "dangerously flawed" and could lead to the complete abandonment of rules that not only should be maintained but strengthened to protect the interests of the larger free television audience.

In reply comments on the suspension "experiment," NAB said the "alleged rationale" offered by cable interests is that the Commission could observe the marketing of TV programs during the four-year period; reimpose its rules if siphoning occurred, or abolish them permanently if no evidence of siphoning were found.

"This proposal...should not be seriously considered by the Commission," NAB said. "Certainly, the Commission should not suspend its anti-siphoning rules only to find that at the end of the four years it no longer has its options."



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CE-3



# Pay Cable Arguments Top The News

## NAB Viewpoint

The chairman of the Television Board of Directors of the National Association of Broadcasters, told the Federal Communications Commission that attempts by pay-cable television operators to charge for programs now available on free TV would add to the nation's spiraling inflation and should not be allowed.

In a letter to FCC Chairman Richard E. Wiley, Wilson C. Wearn, president, Multimedia Broadcasting Co., Greenville, S.C., said that if the Commission proposes to change the rules relating to pay-cable, then it should make an inflation impact study as indicated by President Ford.

The text of Wearn's letter follows.

"In his recent address to the Congress and the American people on the subject of inflation, President Ford expressed concern over 'inflationary costs of all government actions.' Further, he required that 'all major legislative proposals, regulations, and rules emanating from the executive branch include an inflation impact statement that certifies we have carefully weighed their effect on inflation.'

"The Federal Communications Commission now has before it proposals that would be extremely inflationary and would affect the pocketbook of every family in the United States. If the Commission abandons its defense of television which is available without charge to the average consumer, and permits pay-cable television entrepreneurs to make charges for the type of television programming now available on free TV, it will contribute significantly to the fires of inflation. The average American family simply cannot afford to pay twenty-five to fifty dollars a month or more for television programs at a time when its budgets are strained to the breaking point trying to meet the costs of food, clothing and shelter.

It seems unfair to call upon people to pay higher taxes and then add yet an additional tax in the form of payment for the type of television programs they now receive without charge.

"We urge that the Commission reject the attempt of pay-cable television operators to add to the cost of living of the average family. We respectfully request that if the Commission proposes to change any present rules relating to pay-cable, that it make an inflation impact study as indicated by the President."

## According to Foster, It Is "Totally Absurd"

NCTA President David H. Foster has labeled as "totally absurd" allegations made by broadcast industry spokesmen that relaxation of pay cable TV rules will generate inflation and prey upon consumer pocketbooks.

"Indeed, pay cable will fight inflation and extend the consumer's tight entertainment budget," Foster said. "Pay cable allows a family to see first run movies and sports events for as little as \$.50 per program—a fraction of what it would cost for just one ticket at an arena or theatre."

"The absurd economic arguments of broadcast lobbyists are typical of the outlandish and unfounded claims the television industry has used throughout its campaign against pay cable," Foster said. "Broadcasters continue to toss emotion-laden, headline-grabbing charges into this proceeding which they think will win the sympathy of the viewing public."

"I know that the FCC will not succumb to these false arguments,"

Foster added.

His comments came in response to charges made during the opening session of FCC hearings on pay cable regulations.

Foster said that such unfounded arguments as those outlined by Eliot Janeway, an economist hired by the National Association of Broadcasters to describe his fatalistic view of pay cable, and other NAB spokesman avoid the principal economic issues in the pay cable situation.

Unrestricted access to sports and movies would lift the monopolistic stranglehold broadcasters now have over such programs, Foster said. Such competition would bring back true "marketplace economics" which would lower the price of these programs, he added.

Foster cited the ever-escalating prices which broadcasters pay for shows—up to \$10,000,000.00 for a single network movie.

"This translates into rates as high as \$200,000 per minute of TV commercial, and that is filtered down to the consumer in the form of higher prices for advertised products," Foster said.

"If anyone should be accused of encouraging inflation, it is the broadcasters themselves," he concluded.

Citing the number and diversity of public interest and cultural organizations which have called for an easing or elimination of pay cable regulations, National Cable Television Association President David Foster told the Federal Communications Commission that it must heed the demand to abandon the current restrictions.

Foster emphasized that a major segment of the comments filed at the FCC last month in the latest phase of the Commission's pay cable proceeding came from groups with no vested interest in the issue.

"More than 85 percent of the comments submitted to the FCC called for relaxation or elimination of the pay cable rules," Foster told a meeting of the Pacific Northwest Cable Communications Association.

"Even more significant was the variety of groups seeking such FCC action," Foster continued. "It included cultural groups such as Lincoln Center for the Performing



Arts and the Metropolitan Opera in New York and the Kennedy Center in Washington as well as sports interests such as the National Hockey League, National Basketball Association and the Commissioner of Baseball."

In addition, motion picture studios, public interest groups, trade unions, financial analysts, educational institutions and government agencies asked the FCC to ease its restrictions on the type of programming which pay cable can carry, Foster pointed out.

"While sheer numbers do not prove that public sentiment is totally on our side, I think it is significant that so many groups with little or no vested interest in the issue chose to take a stand on the subject," Foster said.

Foster pointed out that more than 70 organizations filed comments at the FCC in the latest phase of the pay cable proceeding. Of that total, nine were submitted by TV networks, TV stations or broadcasting trade associations. One was submitted by the theatre owners trade association.

"All of those groups have a vested interest in preventing the growth of pay cable," Foster charged. "Their comments are laced with protectionist pleas and unfounded accusations which they are using in an effort to stymie a marketplace decision on the future of pay cable."

Foster noted that about 20 of the pro-pay cable comments came from parties with vested interests in the development of pay cable—primarily cable TV associations and CATV operators.

"What is important," he emphasized, "is the 40 other parties who have entered into the proceeding. They feel that pay cable TV will be of benefit to the people they serve and the citizens they represent. At the very least they have asked the FCC not to continue artificial and unnecessary restraints on the development of pay cable merely to protect broadcasters' interests."

Foster cited excerpts from the comments of many parties which filed comments in the pay cable docket. In particular, he emphasized a remark from the Office of

Telecommunications Policy.

Quoting OTP Acting Director John Eger, Foster said, "Those arguing for restrictions on the public's opportunity to purchase

new cable programming services should have the burden of proving their case and ought to be held to a high standard of proof. This burden has not been met."

## Cable Executives Call Rules "Monopolistic Protectionism"

Cable Television executives have characterized Federal rules on pay cable TV as "monopolistic protectionism" and urged the Federal Communications Commission to abandon its restrictions over pay cable development.

Speaking at the opening session of FCC public hearings on pay cable TV rules, the group of four CATV and pay cable company officers said any restrictions on what can be cablecast is contrary to public interest and marketplace free enterprise.

Monroe Rifkin, president of American Television and Communications Corp., criticized FCC rules which, he said, deter the development of cable TV and at the same time stymie the public's opportunity to see programs other than what commercial TV offers them.

Rifkin cited the massive capital investment required to build a broadband communications system such as the FCC envisioned for CATV. Unrestricted pay cable service would generate a revenue base which, in turn, would make possible new urban cable services, Rifkin said.

Barry Zorthian, Time Inc. vice president, refuted charges by broadcasters that pay cable might siphon programs from commercial TV.

"Siphoning is not in the cards and any claims to the contrary do a disservice to the American people," Zorthian said. "We want (the rules) changed to permit us to have access to what is warehoused, to what is denied to the American people, not to take away what is available to them."

Ralph Baruch, president of Viacom International, directed his comments to FCC restrictions which now limit the number and age of "classic" films permitted on

pay cable channels. He called for a complete elimination of restrictions which prohibit viewers from seeing films on pay cable after network telecasts.

"Once a motion picture has been shown on national television the public interest has been served, and the open and free marketplace should come into play without un-needed rules, regulation or interference from the Commission," Baruch said.

Geoffrey Nathanson, president of Optical Systems, criticized broadcasters for "warehousing" films to keep them off pay cable TV. This is done, he said, when networks buy exclusive rights to new films and then prohibit film distributors from selling pay cable exhibition rights prior to the network telecasts.

Such tactics, Nathanson said, diminish the economic footing of the pay cable industry and reduce the value of such service to subscribers. He characterized such economic power-plays and FCC limitations on new movies as the major obstacles in developing a marketplace system which allows viewers to choose the programs they want to see on pay cable.



"THE INVITATION READ, 'BRING YOUR OWN ENTERTAINMENT, DIDN'T IT... DIDN'T IT?'"



# Shooting film for TV

By Ron Whittaker

For the cinematographer not familiar with the normal limitations of the television system, it has often been a mystery why a film can look so good when projected on a screen, and then look so bad when reproduced by television. Because of the specific requirements and limitations of the television process, a cinematographer must constantly keep in mind certain important guidelines and precautions when making film for television.

## Exceeding the Brightness Ratio

Probably one of the things which causes the most problems with films for television is when the subject matter exceeds the standard 20:1 brightness ratio of the television system. This normally causes a highly undesirable compression of the picture's tonal scale. The most common example of this—and probably the most extreme kind of example—is when a subject is shot outdoors against a bright sky, or inside in front of a brightly backlit window, venetian blind, or curtain.

In order for the television system to accommodate the extreme bright to dark range in a scene such as this, the white video level must be lowered to a point within the system's transmission capability. When a film's relatively wide tonal range is reduced to the 20:1 range of the television system, tonal compression results. Normal face tones, which should ideally lie about midway up the grey scale, end up being pushed down to the darker end of the scale. (See Figures 1 and 2.)

In extreme cases, a normally lit and exposed subject can appear (on television) to be in total silhouette against the bright background. The same film could look perfectly acceptable when projected on a screen.

To combat this problem, the reflectance of fully illuminated subjects for filming should be held to between sixty percent maximum reflectance and three percent minimum reflectance. This represents a 20:1 difference between the "whitest-white" and the "blackest-black" areas which are in any way significant in the scene. The word

"significant" here refers to two things: importance in the scene in terms of needed picture detail, and in terms of area occupied in the scene.

If a white area is very small and does not contain any important detail, it can exceed the sixty percent reflectance limit and be "clipped" in the television process, without significantly affecting the appearance of the televised picture. A common example of this is in spectral highlights, such as reflections from jewelry or shiny metal objects. However, when the "over sixty percent" area starts to exceed about three percent of the total scene, most television systems will start the process of compressing the tonal range of the scale to accommodate the offending white area.

The terms "reference white" and "reference black" are used to designate the lightest and darkest areas of a scene which are "significant", as previously defined. Because of the 20:1 brightness limitations, reference white in a scene filmed for television generally ends up looking rather grey to the human eye, compared to a white sheet of paper, for example. This has led to the term "television white" for tones used in clothing and paper (commonly scripts) which appear white on television, but which are actually a light grey (60 percent reflectance). The old problem of men's white dress shirts upsetting video levels has been greatly reduced with the popularity of pastel colors in shirts.

## Reference Black

Reference black is somewhat less of a problem in the film-to-television process. The three percent point is measured by a reflectance light meter in the darkest, "significant" portion of the scene to be photographed. Keep in mind that

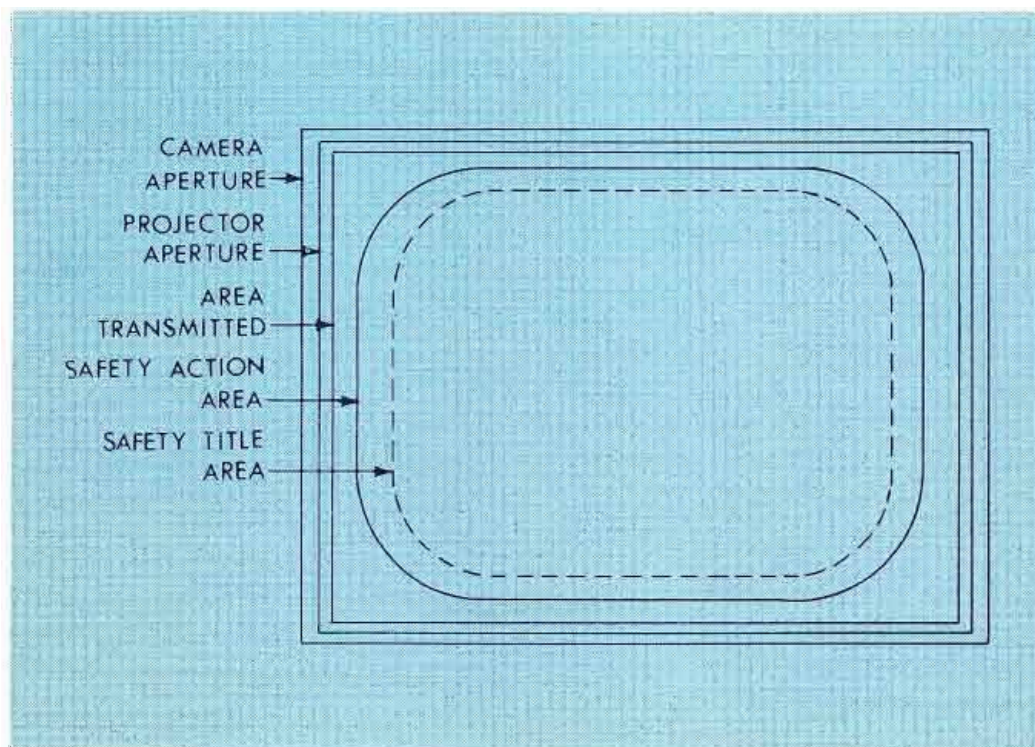


Figure 1



all detail with less than three percent reflectance will be lost.

When filming for television, it is important to retain scene-to-scene consistency in the reference white and reference black levels. Exposure consistency is the basic element here. Variations in exposure, even when the 20:1 brightness ratio is adhered to, will commonly result in scenes being "washed out" or going virtually black for a few seconds before the television process can suitably adjust to the variations.

Although 3:1 lighting ratios were no problem in black and white television, a 2:1 ratio should not be exceeded in filming normal scenes for color television. This, of course, not only applies to the key-to-fill ratio, but also to the key-to-background incident light readings. With the advent of color television, the contrast and gamma control, which formally existed in the special printing and processing of black and white film for television, is, for practical purposes, no longer possible.

### **Television's Essential Areas**

Another problem area which has caused many a headache for the uniformed cinematographer is television's "essential area", or "safety area". Because of over-scanning and other problems in the television transmission process, about ten percent of the total film picture area will (normally) be lost on home receivers. (See Figure 3.) The remaining ninety percent of the picture is referred to as the "safety action area." All important subject matter, therefore, should be confined to this area.

### **Safety Title Area**

There is a second, even "more safe" area of the television picture which represents the margins for titles or writing. This is referred to as the "safety title area", and is defined as the central eight percent of the picture area. (see Figure 3.)

Because of the importance of these safety areas, and the ease by which they can be forgotten in the pressure of shooting television film, some cinematographers have incorporated television safety area masks or guidelines right into the viewfinder systems of their 16mm

cameras. Where the amount of television work justifies it, the size of the film aperture in a 16mm projector can also be reduced to conform with the safety action area. The actual dimensions here would be .33 inch by .25 inch, minus the rounded corners shown in Figure 3.

It should be kept in mind that these safety area percentages also apply to 8mm and 35mm motion

picture film, as well as for 35mm, 2 X 2 slides intended for broadcast.

### **Loss of Picture Detail**

When shooting film for television, it must also be remembered that the resolution of the video process is very limited, compared to photographic film. (This is not true to the same extent for all national systems of color television, however.



**Normally exposed** and developed motion picture film is capable of reproducing a brightness range far in excess of the 20:1 range of normal broadcast television systems.



**When the window** area of this scene is brought within the brightness range capability of the television system, severe tonal compression results at the lower end of the grey scale.



The French system, for example, is technically superior to ours in several important ways. Even within our own country we have closed circuit television systems which are capable of far greater resolution and technical fidelity than our standard broadcast system.)

While the traditional way of measuring film resolution is in terms of paired lines per millimeter, the television system uses a somewhat different criteria. The vertical and horizontal resolution of the television system must be looked at separately.

The vertical resolution of a broadcast picture is limited to about 480 horizontal lines. (About 55 of the total of 525 lines are lost during the vertical retrace phase of the scanning.) Vertical resolution, under the best of conditions, therefore, can never exceed 480 lines.

Horizontal resolution is highly dependent upon the camera equipment involved in picking up the film, the electronic processing and transmitting equipment, and (most importantly) the home reception conditions. Theoretically, the U.S. system of television is capable of resolving over 600 horizontal lines. In actual fact, however, an average home receiver can only resolve between 200 and 300 horizontal lines. The home receiver is by far the weakest link in the whole process.

One of the biggest problem areas in relation to the television system's restricted definition is in the reproduction of written material. You have doubtlessly seen old movies shown on television where most of the credits were illegible. The following are some basic guidelines in lettering for television films.

### **Lettering**

First of all, the number of words attempted on the screen at one time must not exceed 20, even under the best of circumstances. Many television graphic specialists have adopted rules of ten to twelve maximum words on the screen at one time. In instructional television applications, where students may be viewing a TV screen at distances up to 50 feet, the number of words should never exceed ten to twelve. These limitations are based on optimum

conditions, using a highly legible type face with sufficient character to background contrast.

Upper case letters are more legible than lower case. Lines on the screen should be "double spaced"; that is, there must be a space between lines equal to the height of the tallest letter used.

Horizontal spacing between letters and words is even more important. "Condensed" type faces, or letters which look crowded together can quickly become illegible. Between words, a space equal to about a capital "M" or "W" should be used. Between sentences the space should double this.

The contrast difference (brightness ratio) between the letters and their backgrounds should be at least three to one. All things considered, dark letters against a light background are more legible than light letters against a dark background.

### **Color Compatibility**

The next big problem area for the television cinematographer is that of color compatibility. There is a large percentage of black and white sets in use in the United States today. A scene which looks "breathtaking" in color can be muddy and totally lacking in tonal separation in black and white. Many colors, although they will have great hue contrast, will not have tonal contrast. Red letters on a blue background, for example, may have high legibility in color, but many totally merge together in black and white. The problem of color compatibility and good tonal separation is one of the biggest problems television production personnel have had to struggle with in the change from black and white to color television.

Sufficient tonal separation in important subject matter areas can be easily checked with a reflected light meter. A good spot meter can be a real boon in solving both the problems of contrast ratio discussed earlier and to the problems of adequate tonal separation. The actual difference in reflected brightness needed between two tones or hues to give adequate tonal separation will depend upon the size and importance of the area in question. A twenty to thirty percent difference in reflectance will generally

prove to be adequate for most purposes, however.

### **Simultaneous Contrast**

Another problem related to film reproduced through the color television process comes under the heading of "simultaneous contrast". Large areas of highly saturated color will cause apparent color shifts in other subject matter in the scene. The color shift normally will be toward the color complement of the dominant color. Flesh tones against a large saturated area of red will tend to shift to cyan; against blue they will shift toward yellow; and against green they will pick up a magenta hue.

This problem can be particularly noticeable (and undesirable) in photographing food. Once understood, however, this phenomenon can be used to your advantage. Fresh red meat, when photographed against a cyan background, for example, will be greatly enhanced by taking on a greater color saturation.

### **Moire Patterns**

The last problem, which is not as troublesome with film as it is with live or video taped television productions, relates to moire patterns. When a regular pattern of high contrast detail is reproduced by the television process, it often interacts with the television scanning lines to produce a shimmering, artificial pattern which can be highly distracting.

This moire pattern is often rather difficult to predict, due to many variables involved, but suffice to say, the cinematographer should avoid closely-spaced, high contrast lines or patterns in sets or clothing. Probably the worst offender in this regard are the patterns in some men's sports coats.

The foregoing should be considered as only the most basic guidelines in making films for television. The cinematographer highly involved in making television films will undoubtedly want a far greater understanding of the limitations, problems and potential of the television process. But with these basic guidelines well in mind, the average cinematographer should have no trouble in shooting consistently acceptable television film.



# Audio console roundup

The console business has been on the broadcast front burner for the past year. And, as you will see in this roundup of currently available consoles, the number of entries, options, and styles is steadily climbing.

Consoles stood pat for so long that many stations put their engineers to work designing custom consoles to fit individual station needs. Over the years, **Broadcast Engineering** has featured a variety of "build-it-yourself" consoles. Recently, however, console manu-

facturers have made so many changes that, even though some still have the long familiar control room look, they are far removed electronically from the consoles of the 60's.

The choices today are so deep that if we were to run pictures and individual features on the entire spectrum, it would take several issues of **BE** to be complete. Instead, we have asked manufacturers to select their high interest consoles and tell us about the pertinent features. Meanwhile,

you can look for consoles to share the limelight with electronic journalism at the 1975 NAB convention. In one afternoon at the convention, you could see most of the consoles in this roundup and those pictured in the current ads.

If you're moving in on a buying decision on a console for the control room or the production studio, you may want to use the reader service card numbers to get further specs for comparison and discussion when the buying team meets.

## Audio Designs BC-5 Series

The new BC-5 Series production consoles are designed to meet today's competitive audio requirements, while allowing for the needs of the future. Ease of expansion through the choice of modular plug-in components (770 input and 873 Series output modules) are the key to system flexibility. The BC-5 console is well suited to studio production work.

Features proven state-of-the-art studio design, modular plug-in components, 5-year warranty, 4 outputs with individual VU's and monitors, cue, foldback and equalizers, flexible-



up to 16 low-level inputs or 28 high-level inputs, echo send on all inputs and echo return on all masters.

For More Details Circle (59) on Reply Card

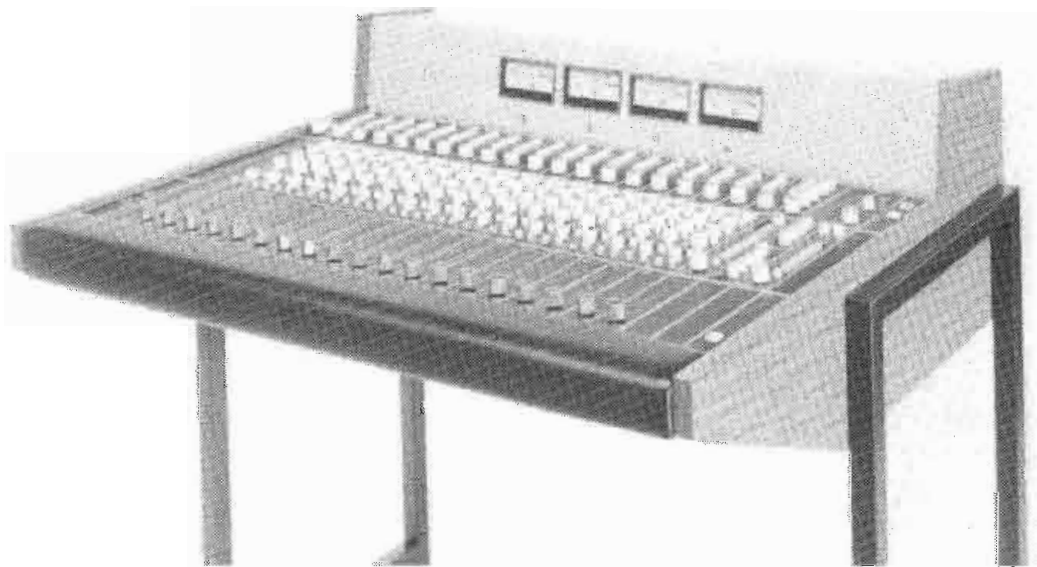
## Audio Designs ADM Consoles

These new **Audio Designs** ADM consoles are modular, multi-product (up to 32) by 4 submaster, TV studio and production center units. Proven state-of-the-art TV studio design; modular plug-in components; 20 low-level inputs or 104 high level sources for flexibility; 4 submaster busses with selection to 2 master busses; echo send on all inputs and submaster; echo return on all submasters and masters; selective group mic muting; 14-band reciprocal equalizers available on all inputs; cue on all inputs - selective foldback on all inputs. Five-year warranty.

For More Details Circle (60) on Reply Card

## Auditronics Recording-Mixing Grandson

Model 110 is a new expandable, completely modular professional recording/remixing/on-air audio control console from **Auditronics, Inc.** Designed to accommodate up to 16 track recording and on-air applications, the free standing unit is expandable to 18 mixing positions—36 inputs—in only 36" width. It offers complete metering, two echo send/receive channels, talkback communications, separate control room and studio monitoring, test oscillator, and a full line of matching accessories including a plug-in patch bay.





A unique second generation, full capacity system at a moderate price, GRANDSON, fills the gap between conventional broadcast consoles and sophisticated recording consoles. The most recent integrated circuit designs as proven in the widely accepted Model 501, SON OF 36 GRAND, are utilized.

Monitoring functions and muting circuitry are TTL logic controlled and

may be re-programmed by the owner to meet specific requirements. To accommodate the exceptional dynamic range requirements of this multi application device, 20 dB headroom is provided over +4 dBm output and each input position may be ordered with a stepped input sensitivity control handling levels from -70 dBm to +20 dBm, a 130 dB dynamic range.

For More Details Circle (61) on Reply Card

## Automated Processes Model 1604



The new audio control console, Model 1604, from **Automated Processes, Inc.** (80 Marcus Drive, Melville, New York 11746) offers flexibility. Performance options can be selected from among plug-in modules, and a variety of interchangeable equalizers is also available.

The relatively low cost of this console makes it suitable for use for either **fixed** or **remote recording**, and as a **production** or **on-the-air** console. It will accommodate 16 inputs, 4 echo

channels, 2 foldback circuits, 4 output channels, 4 submasters, 4 speaker monitoring, slate, tone and intercom circuits, and audition and cue facilities. For broadcast application, the 1604 console has the necessary foldback, audition, intercom and program interlock features, and may be equipped with optional modules offering remote control of tape machines and turntables, or remote input pre-selection.

For More Details Circle (62) on Reply Card

## Ampro Corporation Slide Fader Console

**Ampro Corporation** can supply either the older format console or the slide fader versions in 4, 6, 8, 10, and 12 channel models with mono, dual mono, stereo and dual stereo versions. The slide fader console shown here is a 10 channel unit.

The other unit is the AC-10-S 10 channel stereo console, a full function broadcast audio center. It features four selectable inputs per channel, balanced, triple shielded transformer coupled preamps and step faders with cue in all input channels. Telephone grade lever keys feed a shielded, printed circuit mixing bus network. A low noise boost amplifier, protected line driver and VU meter complete the program signal chain. Dual channel consoles provide a second high

level metered line output from the audition system. Solid state muting relay drivers eliminate pops and clicks.

For More Details Circle (63) on Reply Card

## CCA Futura Audio Consoles

CCA offers a complete line of solid state audio consoles with six- or ten-channel models in mono, dual mono, Stereo, and AM-FM stereo. A complete system is also available with semi-portable furniture for remote originations or the low-budget studio.

Features include plug-in solid state electronics, modern composition slide faders with cue detente, identical amplifiers for program and audition channels, full 10-Watt RMS monitor amplifier cards, and interchangeable high and low level input circuits.

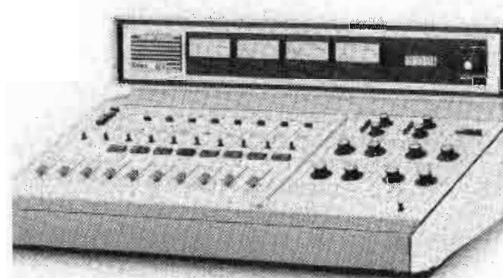
Typical specifications include .1% distortion at +8dBm normal output level,  $\pm 0.5$ dB response from 50 to 15,000 Hz, and -70 dB signal to noise ratio on both audition and program channels.

For More Details Circle (64) on Reply Card

## Cetec Series 10 Quadraphonic

Utilizing the unique circuitry of the Series 10, **Cetec** introduces the quad version of this console. Now discrete channel quad broadcasting is within the budget of the conservative programmer. The Series 10-Q can be utilized for quad broadcasts, and for stereo when not in quad service. Equalizer is standard for the quad console, allowing the operator to insert equalization to selected input channels, or overall output of the console.

Equalizer is simplified and covers 50 Hz and 7.5 kHz with  $\pm 12$  dB of equalization. The reliability of the Series 10-Q is derived from the field proven Series 10 stereo console. This console series meets or exceeds requirements of N.A.B., F.C.C. and exhibits superior RF rejection. Console



is completely self-contained except for rack mounted dual power supply which assures fail-safe operation.

For More Details Circle (65) on Reply Card

## Dyma MA-31 Air Console

**Dyma's** MA-31 air console is an up-to-the-minute design in modern control center equipment. Functionally designed as an on-the-air console, it easily doubles as a versatile production console.

The MA-31 air console features ten channels of dual monophonic programming with two mic channels, two turntable channels with auto cue, an automatic four cartridge channel, an

(Continued on page 20)





## Console Interest Reflects On State Of The Industry

Why all the audio console buying activity in the past 12 months? The answer certainly is not an easy one.

Early this year we began to notice a rise in requests for further information on audio consoles, and that led us to closer scrutiny of this category of broadcast equipment. At first the answer seemed to be the new entries in the marketplace. Manufacturers who previously were solely concerned with consoles designed for the recording industry were turning to the broadcast market as a natural extension of their lines.

There hasn't exactly been a shortage of audio console manufacturers supplying the broadcast market in years past. But anyone who has been around a radio station over the past several years knows that most consoles began to look alike. With the entry of production console manufacturers, broadcasters realized they had an alternative. It wasn't that the specs were different or that there were new options. They looked inviting. Slide controls, longer sloping panels, and control layouts were different, but they also made sense. This is not to say that earlier broadcast consoles were not functional as well as reliable.

Meanwhile, of course, we have seen the influence of FM market conditions that have made FM profitable and viable. Add to that the growth of commercial and educational FM numbers and you have a growing market. And that must include the move from mono to stereo.

From the FM side, you could say that automation would cut console interests. Not so. If you want to go with an all cart operation, you must pay close attention to your production console. In some operations, it has meant spending less time in the control room and more in the production studio.

While quad hasn't been a major factor, it certainly is a consideration. And as the movement grows, so grows the interest of the console manufacturers.

Now AM station numbers have not accelerated in step with FM for obvious reasons. Nevertheless, AM consoles have not been left behind in either electronic or mechanical development. And with good reason.

Even with the growth of FM, AM still has almost twice as many stations. Here, along with FM, though, you must look at market conditions. Expenditures for radio broadcasting advertising in 1974 are expected to reach a new high of about \$1.8 billion. AM is up 6 percent from 1973, while FM is up 20 percent. For 1975, it's predicted that FM will jump another 30 percent, while AM climbs 16 percent.

So, a healthy radio market and changing technology probably will hold the door open on audio consoles throughout 1975.

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# A production console with no compromise in quality

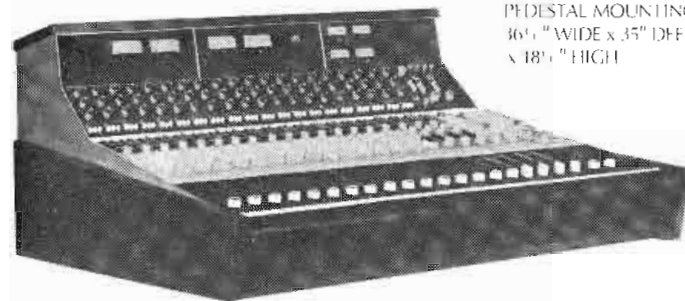


TABLE OR  
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x 18 1/2" HIGH

**AUTOMATED'S**

# AUDIO CONTROL CONSOLE

Model 1604

Never before so much for so little. Flexibility, quality and dependability at a cost that makes this console a completely practical investment.

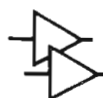
The Model 1604 is designed to be used in a studio, as a remote field unit, or as a production or on-the-air console with quad or two simultaneous stereo outputs.

It will accommodate 16 inputs, 4 echo channels, 2 foldback circuits, 4 output channels, 4 submasters, 4 speaker monitoring, slate, tone and intercom circuits... as well as audition and cue facilities.

There are foldback, audition, intercom and program interlock features, with options for remote control of tape machines and turntables... as well as remote input pre-selection.

Choose from a variety of modular, interchangeable equalizers to provide the flexibility you require. The Model 1604 can be changed or expanded to meet various operating conditions with no compromise in quality, performance or function. Modularity also means ease of servicing. All external connections are plug-in to allow rapid installation. Available table-top or pedestal mounted, and options are factory pre-wired permitting easy incorporation in the field.

Why not get the console with the features you need... at a price you can afford... from the company whose business is serving the audio professional with equipment built to a standard... not to a price.



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For More Details Circle (14) on Reply Card



(Continued from page 18)

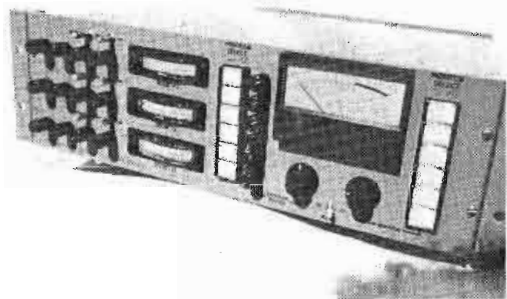
auxiliary cart channel, and four channels for tape, telephone, etc. When turntable channels are off, the signal from the turntable is automatically placed on the cue buss. Each channel has start/stop function for the associated machine.

The automatic cartridge channel is a Dyma exclusive. Four momentary illuminated push-buttons are located under the attenuator. When the button for Cart 1 is depressed, the audio is brought up on the selected buss and the associated cartridge machine is started. When Cart 1 is finished, depressing the Cart 2 button drops Cart 1 audio, brings up Cart 2 audio, and starts the Cart 2 machine.

For More Details Circle (66) on Reply Card

## G.A. Gilbreath & Assoc. Custom Systems

G.A. Gilbreath & Associates is now engaged in designing custom audio systems that include consoles. The one pictured here was designed for Ohio State University.

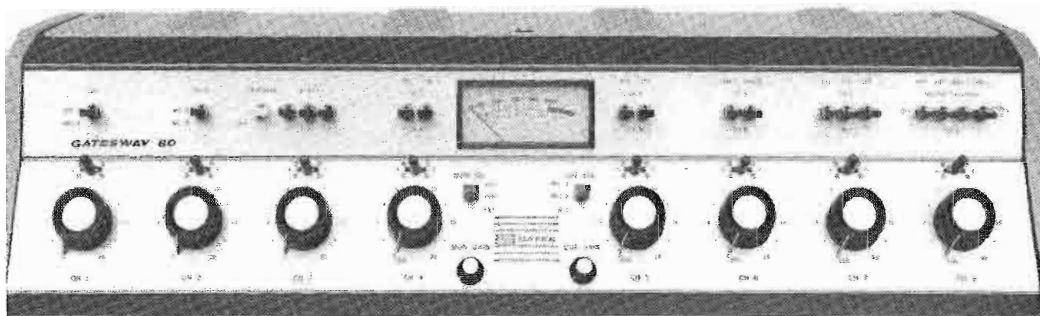


All consoles are individually designed to meet the needs of the individual user. That includes: inputs, outputs, monitoring, size, and shape. Consoles can be designed for broadcast, remote, or special audio uses.

For More Details Circle (67) on Reply Card

## Harris Corporation Gateway 80

The Gateway is extremely flexible, with 18 inputs into 8 mixing channels. These include 5 microphones, 4 turntables, 5 tapes (reel-to-reel or cartridge), 3 remotes and network. Each amplifier is mounted on a separate printed circuit board, which in turn mounts in a card-rack holder. Pro-



gram, cueing and monitor amplifiers all have the same electrical design and construction, and are completely interchangeable. A protective system of warning lights and relay speaker muting is provided to prevent acoustic feedback and broadcasting of cue signal when "live" microphones are nearby. Frequency response is 20 to 20,000 Hz,  $\pm 1$  dB. Distortion is less than 0.5% at all frequencies. All solid state.

For More Details Circle (68) on Reply Card

## Harris Corporation "Stereo Producer"

This is a solid-state four-channel stereophonic production mixer providing all facilities for direct recording, dubbing, sound-on-sound recording, editing and monitoring. Inputs include: 6 microphones into two faders, and 10 turntable, cartridge or reel-to-reel recorders into two faders (for each stereo channel).

An important feature of the Stereo Producer is the ability to make sound-on-sound recordings with ease. The monitoring amplifiers normally bridge the program amplifier outputs. If it is desired to add voice-over on a prerecorded voice or music track, the monitor amplifier is switched to either of the high-level inputs, ahead of the mixers to prevent acoustic feedback.

For More Details Circle (69) on Reply Card

## LPB Inc. S-15/8 Channel

The LPB S-15 8-channel dual output mono console contains eight input mixer channels and is suited to requirements of radio and TV control rooms and production studios. It uses an all-solid state system designed for long life under daily use.

Because the S-15 program and audition channels provide identical performance specifications, the console can be used as a dual-output channel console. This feature allows the program channel to be used for on-air programming while the audition channel is simultaneously used for production and recording purposes.

For More Details Circle (70) on Reply Card

## LPB Inc. S-9B 4 Channel

The LPB S-9B 4-channel mono console is designed for the requirements of the production studio, newsroom, mobile studio, remote site or other applications which do not justify the cost and complexity of a larger console.



Offering considerable operational flexibility in an economical package, the S-9B has special cue switches that are quiet yet solid, allowing definite operator "feel".

For More Details Circle (71) on Reply Card

## Maze 100B-16 Production Console




The Maze 100B-16 is a fully flexible 16-in, 16-out 4-buss console complete with conductive plastic sliders, full monitor and mixdown panel, talkback with mute, echo, three stages of equalization, pan, solo mute button, and more. The unit is designed for tabletop mounting and measures 29" x 48" x 17" and has a frequency response of +1dB. The console comes complete with heavy duty Lambda 24-Volt power supply which is designed for outboard mounting and is priced at \$9,500.00.

For More Details Circle (72) on Reply Card

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## McCurdy 7700 Series

The SS 7700 series of television production and recording consoles is a logical extension to the **McCurdy** package approach to engineered systems.

The design criteria of the SS 7700 series basic format allows for easy expansion to a maximum of 26 functional channels, which may consist of almost any mix of input channels, submasters and masters.

A full range of auxiliary functions, such as remote controls, are available to ensure that the total design is completely integrated to the user's requirements.

Functions available within each channel include: Echo-sends; straight-line faders; Sensitivity; Solo and Cue busses; Phase reversal; Sub or Master Assign pushbuttons.

For More Details Circle (73) on Reply Card

## McMartin B-800 Series

The **McMartin B-800 Series**, 8-mixer audio consoles are available in six standard models; for single and dual-monaural, stereo and dual-stereo (four channel); stereo plus combined simul-

cast mono; and dual-stereo plus combined simulcast mono operation.

The console system design uses plug-in modules for all input program, audition, monitoring and power supply function. This approach, particularly for the input modules permits great latitude in meeting the specific operating requirements of each user.

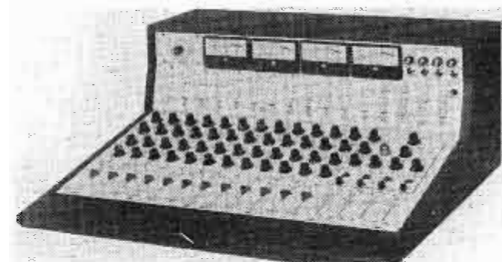
The standard complement of modules provides for three low-level and four high level input mixing channels. Each channel is equipped with push-button switch input selection of three sources. Monitoring/speaker muting logic for four microphone origination locations is standard. The systems accommodate up to three microphones in each of two studios; two microphones in a third studio and single microphone origination from an announce booth and the console operating position. One mixing channel accommodates high level balanced inputs from four remote lines, network line and an auxiliary source. The four remaining high level mixers accept unbalanced low impedance sources. These may be converted to balanced high level inputs; or to RIAA equalized phono inputs by substitution of optional plug-in modules. All module input connectors are prewired to ac-

cept any of the input module models.

For More Details Circle (74) on Reply Card

## OPAMP Labs, Inc. 1204

Here's an unusual production console that can be used for radio and TV and can be ordered in a wired or kit version. This 12-input, 4-output console includes such features as: Input noise -127 dBm; output level +24 dBm; signal to noise 70 dB; and mix



pot, cue switch, input select and echo send per input channel.

Also included are internal power amplifiers for mixer monitor, boom feed, director monitor, auxiliary monitor, distribution amps, and cue. In addition, there is a five-frequency test oscillator, cue on all input channels and cue speaker, four distribution amps with four outputs each, one echo buss, and submixes for mixer monitor, slate mic, director monitor, and boom monitor.

For More Details Circle (75) on Reply Card

## Rupert Neve Model 8301

This console is newly introduced by **Neve** to offer portability and comprehensive facilities. The console is just 24.8 inches long and 11.1 inches high with 10 equalized input channels and 4 mixing busses (2 program and 2 auxiliary).

Pre-fade listen (PFL) is provided on overpress of the fader. After-fade listen (AFL) also is provided. Two speaker monitor systems, and two playbacks to monitor system are provided along with talkback facilities. A line-up oscillator is included.

For More Details Circle (76) on Reply Card

## Rupert Neve & Company Broadcast Console

**Rupert Neve** manufacturers some consoles so long they would boggle the mind of broadcast engineers. Shown here is a design especially for broadcast use. (Picture is from Piccadilly Radio, Manchester, England.)

The Neve console features: Four mic input channels with frequency correction and horizontal sliding fader; high level mono input channel and stereo input channels with horizontal sliding fader; mono and stereo output with distribution amps; stereo

(Continued on page 24)

# the source!



that's who **AMPRO** is with a variety of consoles available immediately from stock . . . 4, 6, 8, 10 and 12 channel audio consoles in mono, dual mono, stereo and dual stereo/simulcast versions with your choice of either slide or rotary fader! Heavy duty components used throughout **PLUS:**

- 4 input transformer coupled preamps and step type faders with cue on all channels.
- +24 dBm protected transformer coupled outputs.
- Protected monitor with 4 muted outputs and separate phone amp.
- Built-in cue, intercom & remote talkback systems.
- Stereo phasing test switch for audible evaluation of source phasing on all stereo consoles.

Add in shielded PC board mixing bus to eliminate maintenance problems, 104 dB Mic to Program output and much, much more and you'll see why **AMPRO** consoles set the industry standard. Priced from \$1,795 to \$4,795.

**AMPRO** also manufacture a complete line of automatic tape cartridge recorder/reproducers and multi-cartridge units. Financing available to qualified buyers. Call Alex Meyer collect or write today for details.

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**Management**

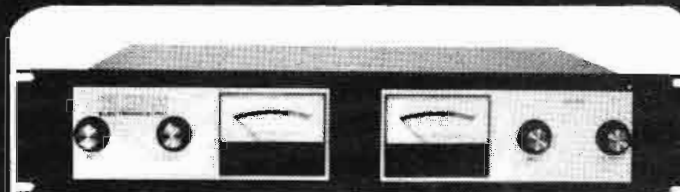
**Highlights**

Consoles represent a category of radio equipment where the team approach to buying is most important. For most stations, the console is at the heart of sound and personality.

Certainly station production needs cannot be separated from engineering knowledge of new technology without causing problems. Once supplied with format and specific operational needs, the engineer becomes a viable voice on the decision making team. He should be able to go beyond the "gee whiz" chrome trimmings to technically interpret station needs, taking into consideration the wide range of options available.

Since the console is a "hands on" item, its selection should come from a consensus of staff opinion. Otherwise, the selection could cause more problems than it solves.

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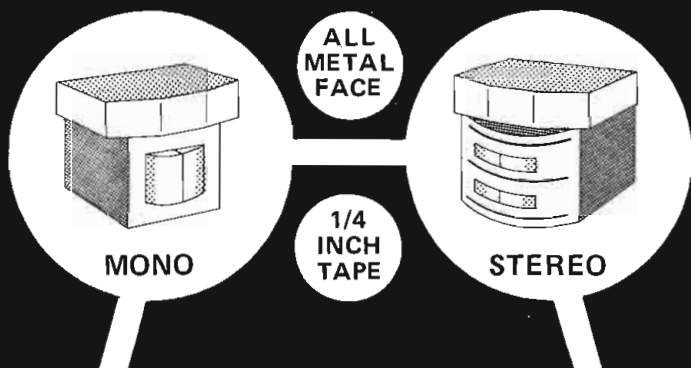
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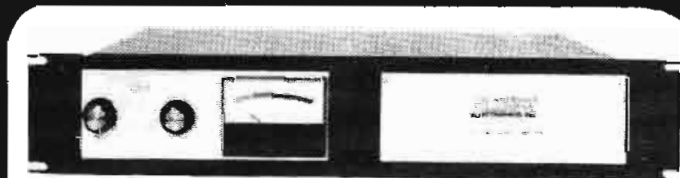
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(Continued from page 22)

output monitor at +4 dBm; reverberation groups, send and return; solo (after-fade) facilities; 2 voice-over units; integral patch panel; cue lights and transmission warning lamps; and reverse talkback with console loud-speaker.

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### **Robins/Fairchild FM Model F30052**

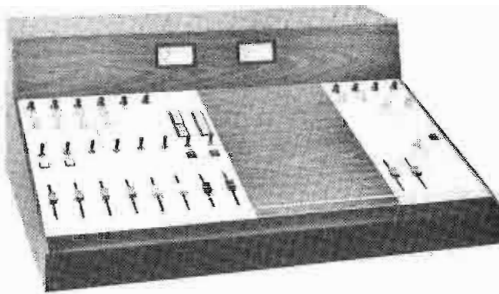
The Robins/Fairchild 3000 series includes this FM version that features 5 stereo input channels with stepless motion faders with cue switches. Total input capability is 12 sources.

Other features include: dual stereo output channels (audition and program); IC Op-amp circuitry on plug-in modular PC boards; interchangeable PC boards for flexibility; studio talkback output; freq. response  $\pm 0.5$  dB, 30 to 15,000 Hz; S/N 65 dB or better, with -60 dBm in, +8 dBm out; crosstalk is below the noise with normal levels and control settings; THD 0.5 percent or less at +24 dBm output; and program output +8 dBm nominal, 150 Ohms, balanced.

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### **Robins/Fairchild Modular ICBM**

This console is particularly interesting because it allows the user to build upon the console's capability by adding modules. All ICBM models are capable of the building block approach. They use Op-amp circuitry.



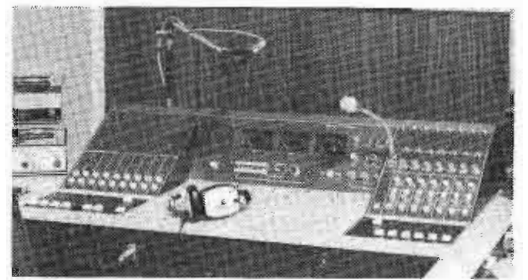
The company claims equivalent noise of -127 dBm and distortion of 0.1 percent as typical for module amps.

This design concept allows the console to be of minimal input/output configuration, or (with module choices) a sophisticated custom console.

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### **Russco Model 505**

The Russco Model 505 features solid state circuitry. Adjustable equalization for either RIAA or microphone



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input. First 4 channels are low level inputs. The 5th channel is fed by 5 separate inputs. Selection by push button switches. A 25-Watt built in monitor amplifier is featured. A 1-Watt cue amplifier and a headset amplifier are also included. The 505 is available either as a rack mount or dest top model.

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### **Russco Model 505-S**

The Russco Model 505-S stereo console uses solid state circuitry. Adjustable equalization for either RIAA equalization or flat response for microphone input on preamps of first 4 channels. The 5th channel is fed by 5



separate, balanced stereo channels. Selection by push button switch. Cue pots on all channels. A 1-Watt internal cue amplifier and speaker is included as well as a stereo head phone amplifier.

Monitor Amplifier is an external, 25-Watt per channel unit and is sold separately.

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### **Sparta Stereo Centurion II**

The Sparta Centurion II is a stereo 8-12 mixer console, with three inputs per mixer in any configuration. It accepts one or two 6-mixer Extender Panels, so that total flexibility is 24-mixers, 72-inputs.

Features include: identical, interchangeable mixer modules; modules switch selectable for hi-med-low level inputs, which automatically select input impedance; noiseless optically-isolated audio switching; external switches turn mixer modules on & off; Form A contacts from console

(Continued on page 55)

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October 21, 1974

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\*Quad version also available.



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# Audio impedance matching

By Pat Finnegan

The variety of component units making up a broadcast station audio system can interface electrically because the input/output circuits have been standardized to specific values. Impedance is only one of these values.

When terms have been around for a long time they can become so commonplace that they tend to lose significance in the minds of the users. The electrical values, however, are still valid even though we may become careless at times. Careless practice when matching impedances will incur several forms and degrees of penalties, resulting in poor system levels, amplitude and phase distortion, and poor response curves across the passband.

## What It Is

Impedance is an electrical value which contains both resistive and reactive components, expressed in Ohms. The amplitudes of the audio

signal into or out of an amplifier are directly related to these impedance values.

To obtain the most efficient transfer of audio signal power from one unit to another, the impedances between them must be matched. This match must hold for all frequencies in the passband.

## Penalties

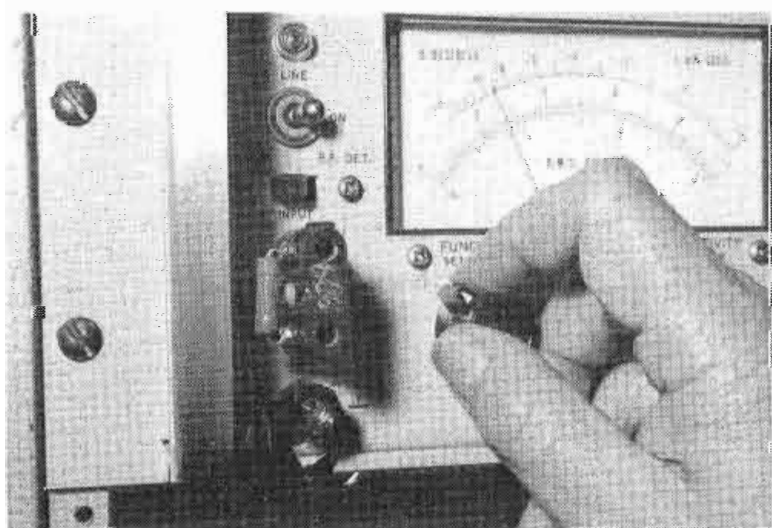
Mismatching the load impedance to the driving impedance will incur penalties in operation. What kind of penalties take place or the severity, will depend entirely upon the elements involved in the particular case. Here are a few ways in which mismatching can effect operations. But remember that more than one type can occur at the same time.

An amplifier whose load is improperly matched towards the low value side, will have a low amplitude signal output. To overcome this loss in level, the gain control may be advanced. This will lose the

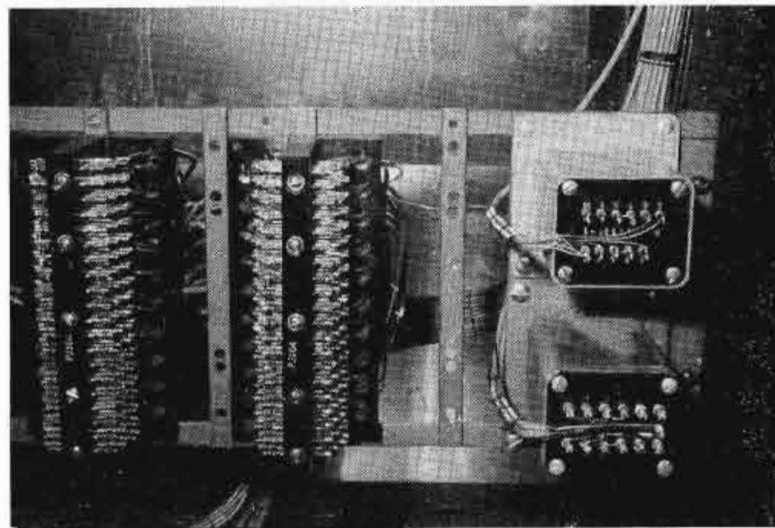
“headroom” designed into the amplifier so that internal stages will be overloaded and cause amplitude distortion. At the same time, the output stage will be required to deliver a high signal current, perhaps more than design limits, which would cause distortion itself and perhaps damage the transistor.

Mismatching at the input of an amplifier towards the low value side, will cause a low amplitude input signal to the amplifier. The amplifier gain control may be advanced to make up the loss in signal level, but the signal to noise ratio will deteriorate. At the same time, the amplifier operating at high gain will make it susceptible to interference, especially if it is located near high RF fields.

Unless the reactive components of the driving impedance are properly compensated by the load impedance (a match), frequency related effects will occur. The type of frequency discrimination will depend upon the reactive compo-



When patching into a jack field to measure an amplifier output level, the voltmeter should have a termination across its input to properly load the amplifier. (Load can be seen at input, lower left side of meter.)



Two transformers permanently mounted in the rack and different matching impedance windings wired to jacks. This arrangement allows quick isolation or matching on a temporary basis.



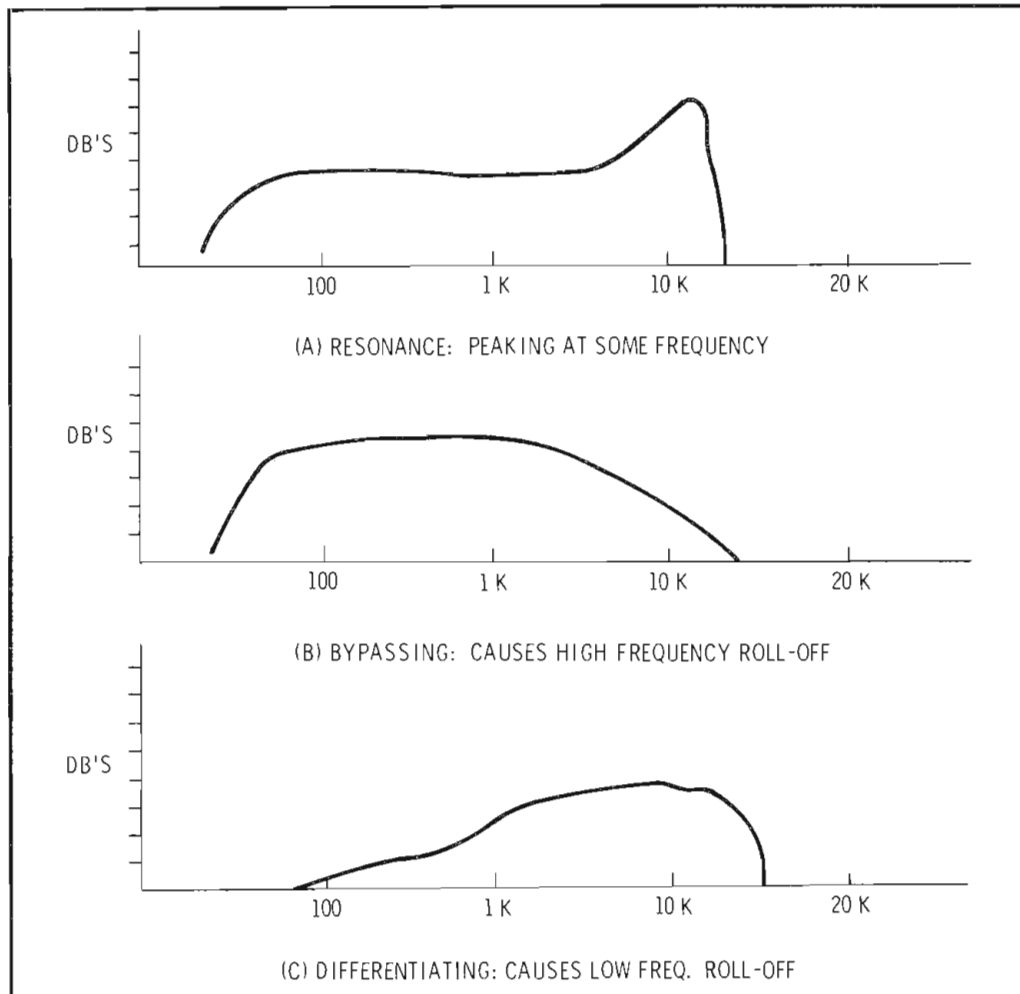


Fig. 1 Various effects the reactive components can have on the signal in a mismatched circuit.

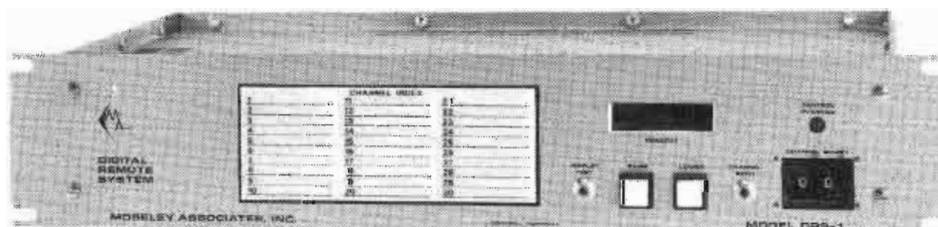
nents and the direction they are acting. If resonance occurs, there will be peaking of one or more frequencies, while capacity across the circuit can act as a bypass and roll off the high frequencies, or other situations can cause a roll off of low frequencies. There will not be a good response curve, and phase errors can be introduced, which can be detrimental to a stereo system.

**The Ideal and The Practical**

Whenever there is an impedance mismatch, there will be some penalty incurred. We must, however, differentiate between the ideal and the practical, for we live in a practical world. There are often cases when an inadvertent mismatch does occur along with some associated penalties, but the net result may be very acceptable for the application or even go unnoticed. This is not to say that the ideal is not a positive goal to strive to attain. But the perfectionist who

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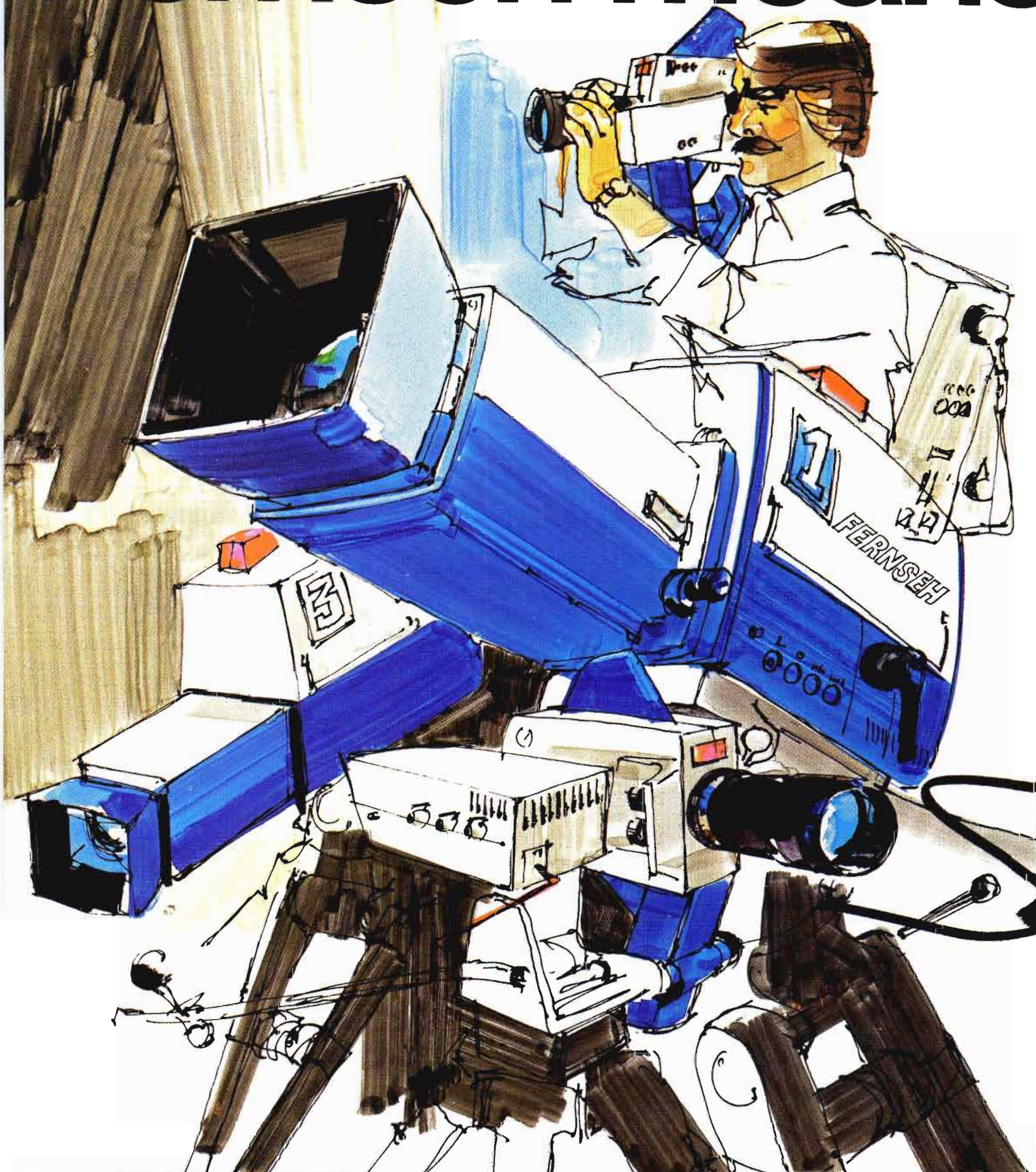


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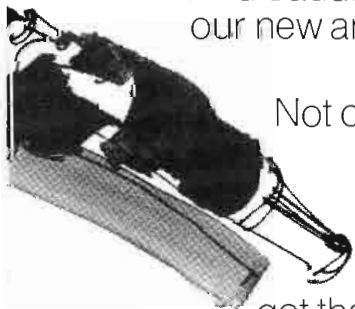
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would lose sleep over the fact the response curve at some point in a system is off by 0.1 dB is bucking for an ulcer!

Although there can be cases when a mismatch occurs and various degrees of penalty must be paid, no general statement can be made as to how much can be tolerated. Often, a critical listening test will suffice. At least one instance comes to mind — a schedule "E" remote telco lines. Even a loaded line at best can pass from approx. 200Hz to perhaps 3 kHz. If a mismatch following this line should occur that would roll off frequencies above 10 kHz, the effect would be unnoticeable, as there would be nothing of this value left in the signal at the end of the line anyway. As a matter of good engineering practice though, it is better to strive for the ideal when that is possible to attain, but also realize that there may be other situations when the ideal has not been met but the results are acceptable.

### Some Practical Cases

Many broadcasters use industrial type communications transceivers for remote pickup use. The receiver in this type unit will seldom provide an audio output, other than a speaker or perhaps a jack for an-

other speaker. To match this unit to the station system, use a line to voice coil transformer, connected across the internal speaker side of the output transformer. If there are any taps on the transformers, adjust for the best match. As an alternative, use a switch so that either the speaker or the coil is on the output. The output level will probably be too high for the system, so use a resistive pad to lower the level. Besides providing matching, this transformer will also provide isolation between the unit and the system.

Test equipment and test setups can provide many opportunities for mismatch problems and resulting

erroneous test readings. Test setups should duplicate the normal system operating conditions. One should be aware of the output circuitry in the signal generator in use. In one popular instrument, the output meter is isolated from the calibrated attenuator by a transformer, and the attenuator is balanced internally to ground. With this instrument, if the wrong driving impedance is selected, the internal meter will indicate supposedly correct levels, but the actual signal to the amplifier under test will be far from correct.

In another arrangement, even though the correct impedance has been selected, should the input of

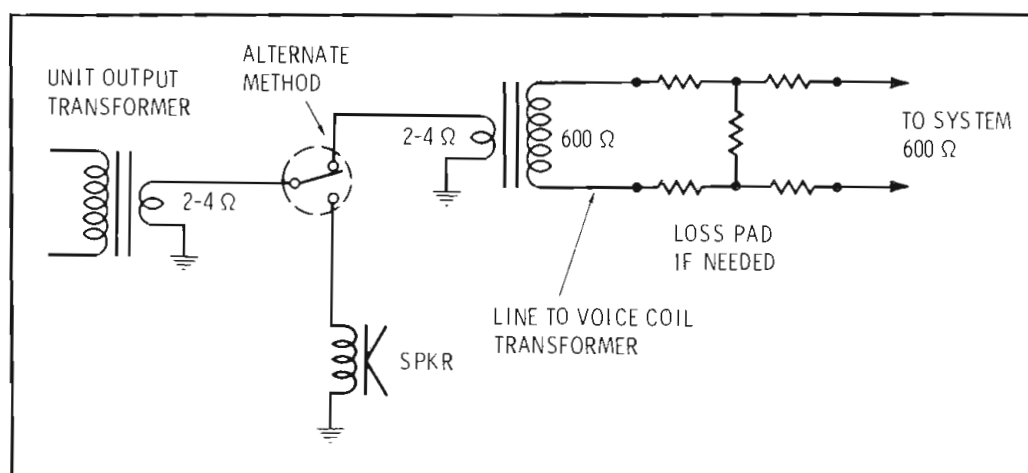


Fig. 2 One method of matching the output of a communications transceiver to the station audio system.

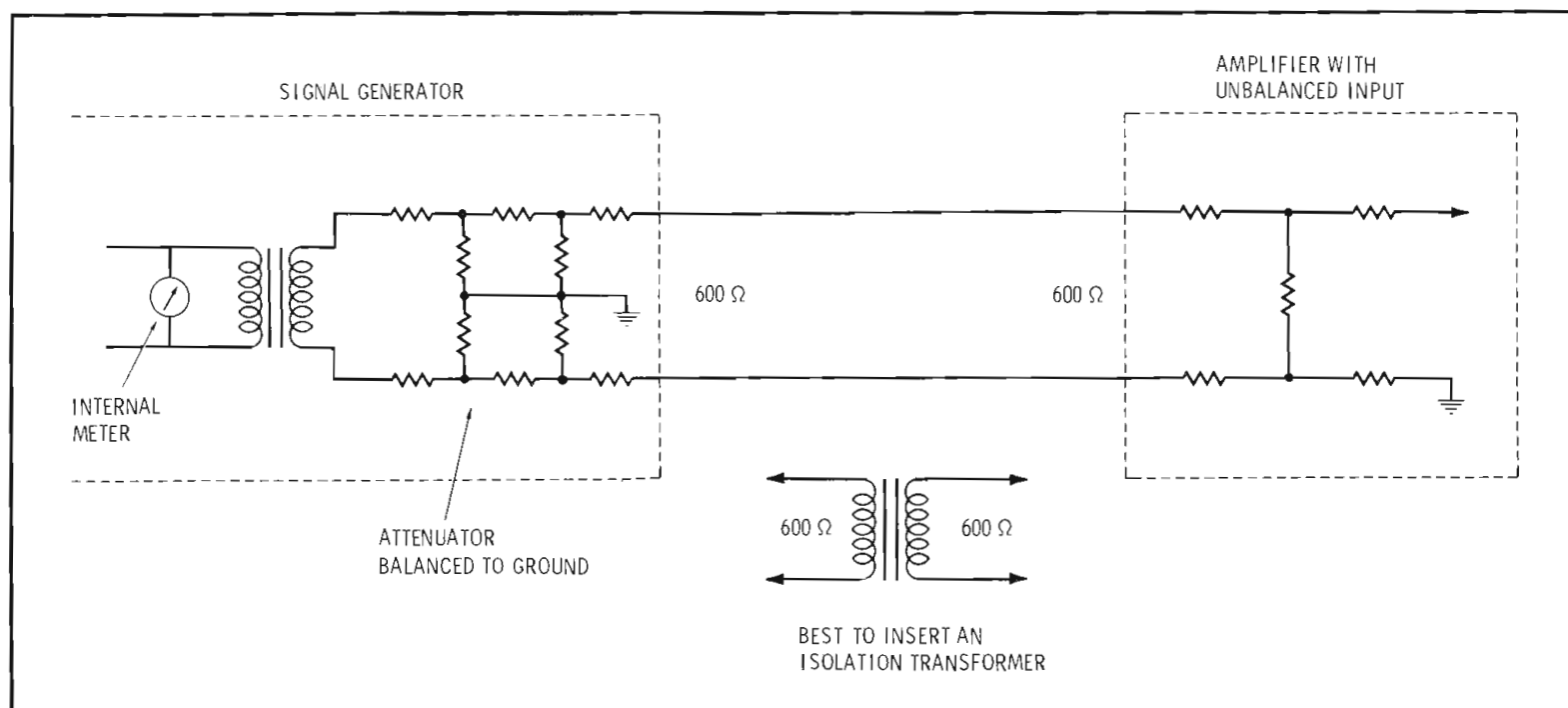


Fig. 3 If the load is unbalanced to ground and the generator attenuator is balanced to ground, use an isolation transformer to prevent shorting out half the attenuator.



the amplifier under test be an unbalanced input, this will short out half of the attenuator and again provide incorrect signal levels. Yet, the internal meter would indicate that the output is correct.

Measuring amplifier output levels with an instrument type voltmeter can indicate incorrectly unless precautions are taken to make the correct setup. When measuring an amplifier that is wired through the

normal contacts in a jackfield, plugging in the voltmeter will lift the load off the amplifier, so now its output level will be higher than normal. The amplifier must be terminated in its proper load impedance, as the voltmeter is usually a high impedance input.

The voltmeter input is also an unbalanced arrangement, so if the case is grounded it will short out half of the amplifier output trans-

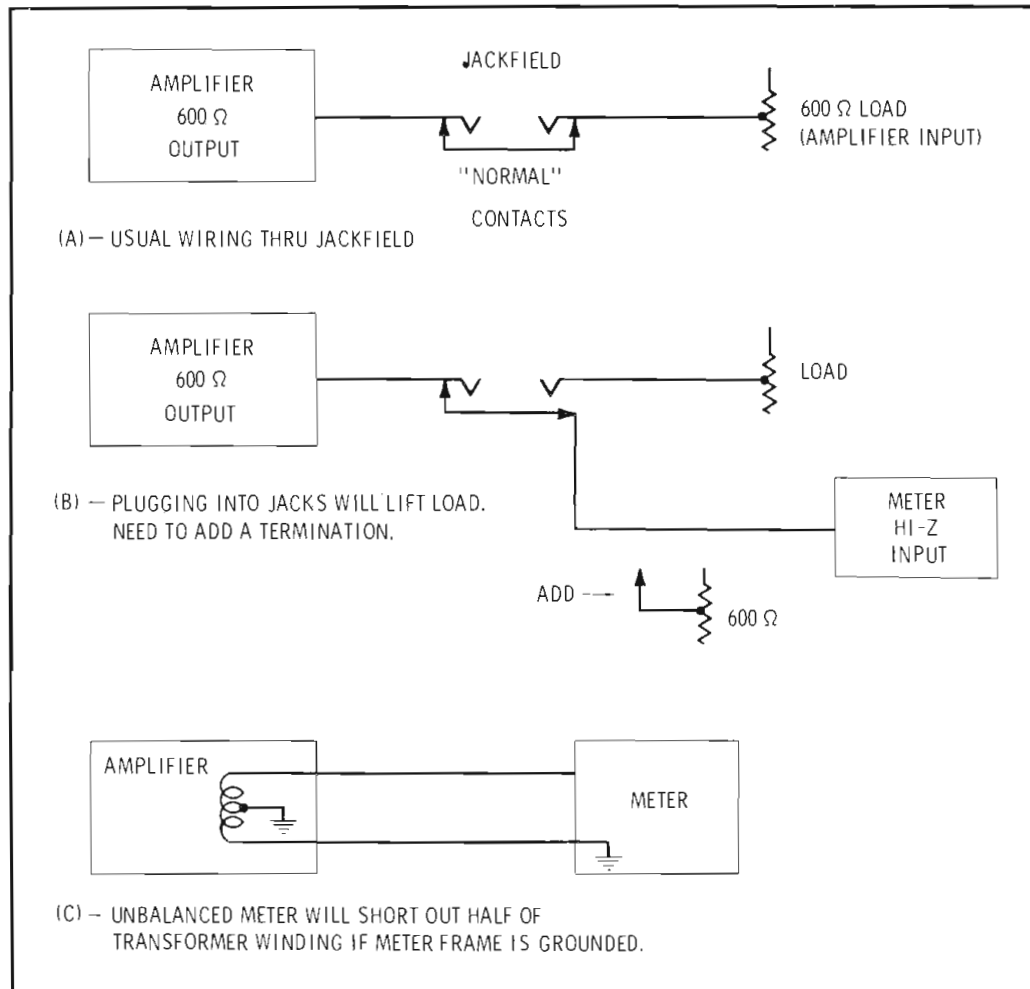


Fig. 4 Various problems when measuring the output in a test arrangement. Incorrect levels can be indicated when the impedances are not correct.

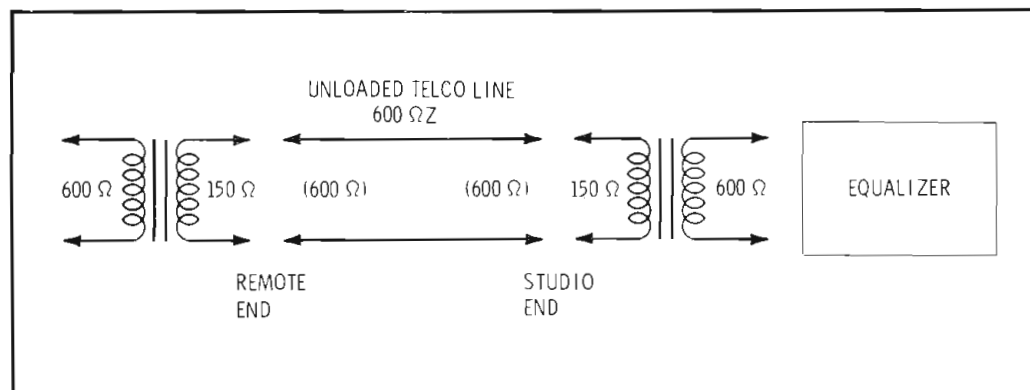


Fig. 5 Equalizing an unloaded Telco line. Although the line has a surge impedance of 600 Ohms, matching in and out of the line is done as though it were 150 Ohms.

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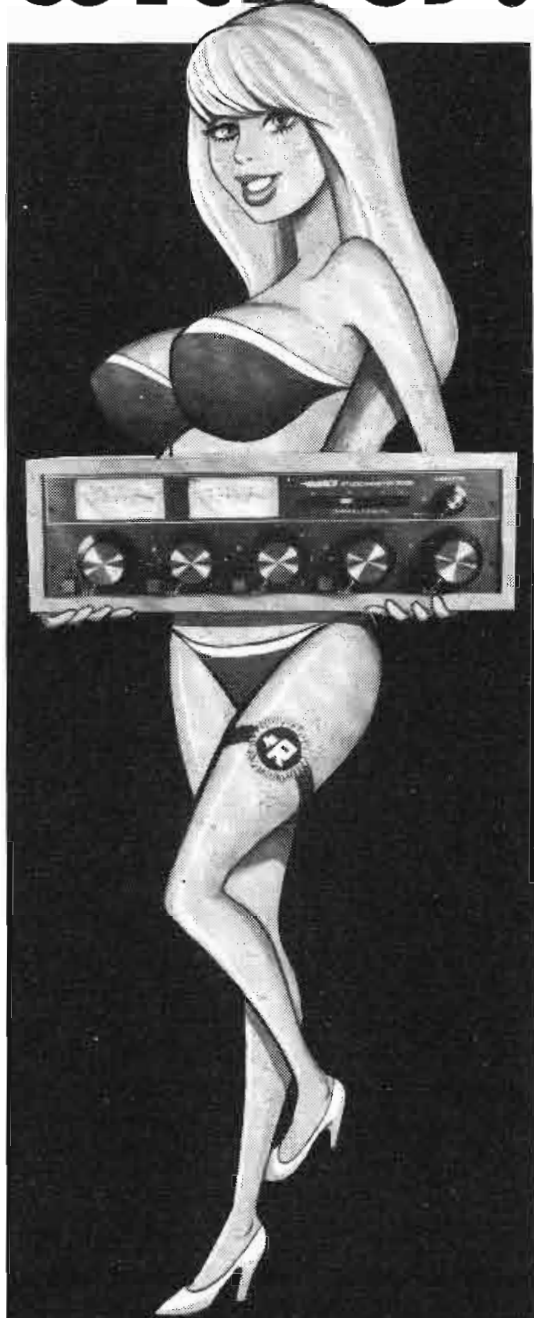


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former should that transformer be balanced and center tap grounded. This would also give a false level indication.

Controlling signal levels between amplifiers is often done with resistive pads so that the amplifier gain controls can be operated at mid-range. Home built pads are generally acceptable for this application. Formulas can be found in several books on how to calculate the resistor values needed, but it is the lucky engineer indeed, who can go to the resistor cabinet and find those odd-ball calculated values! As a practical matter, select resistors that are close to the calculated values as possible. The net results will be a slightly different loss figure and a slight mismatch. The mismatch should not cause any problem, but actually measure the resistors with an Ohm meter to get those on each side of a balanced circuit as nearly equal as possible. Once the pad is built, arrange a test setup and actually measure the loss figure you have created. But remember to drive with the correct impedance and terminate with the correct impedance. However, if the circuit is a critical one in which the values must be exact, the best course of action is ordering a precision pad to do the job.

Resistor pads are often used for matching purposes, and these should contain as little loss as possible. Formulas are also available to calculate these pads, and the same principles hold as previously mentioned.

The matching element most often used is the transformer. There are many types of these available, and they have different impedance matching capabilities and values. These may be types that strap windings together in series or parallel arrangements, or they may be tapped windings. Those with tapped windings can be mounted in a rack and the different impedance values wired to the jack field, so that desired matching can be as handy as a couple of patch cords. Of course, if they were used in a fixed arrangement on one circuit,

they wouldn't be brought out to jacks.

In many cases, impedances can be treated as simple resistance values and computed for series parallel combinations, but with the due caution for the reactive components present and their effects. For example, an earphone rated at 2,000 Ohms impedance can be placed across a 600 Ohm bus with little effect on the bus. But a particular bus must have 4 locations where headsets must be attached permanently. Four 2,000 Ohm headsets in parallel will be an equivalent impedance of 500 Ohms, and this will pull down the bus impedance and the signal levels. The better arrangement, of course, is series resistors with the headsets or higher impedance headsets.

### **Critical Areas**

There are critical areas when the impedance must be matched accurately. Fixed equalizers or curve shapers, such as a pre-emphasis or de-emphasis circuit must have both the driving impedance and the load impedance matched accurately. A mismatch can distort the desired curve drastically.

Yet, in some instances, deliberate mismatching is done to assist in the equalizing process. The Telephone Company does this when they equalize a broadcast loop. A normal unloaded cable pair will have an impedance of 600 Ohms. Matching transformers at both the driving and the terminating end of the line are strapped to treat the line as if it were a 150 Ohm circuit. The opposite side of these transformers are still set for 600 Ohms. There is a signal loss when this is done, but the equalizing process is enhanced.

### **Summary**

Impedance is still a valid electrical value that should be matched properly as a matter of good engineering practice. But in practice, there can be cases when a mismatch will occur and the resulting penalties can be tolerated. When critical circuits are involved, match carefully.

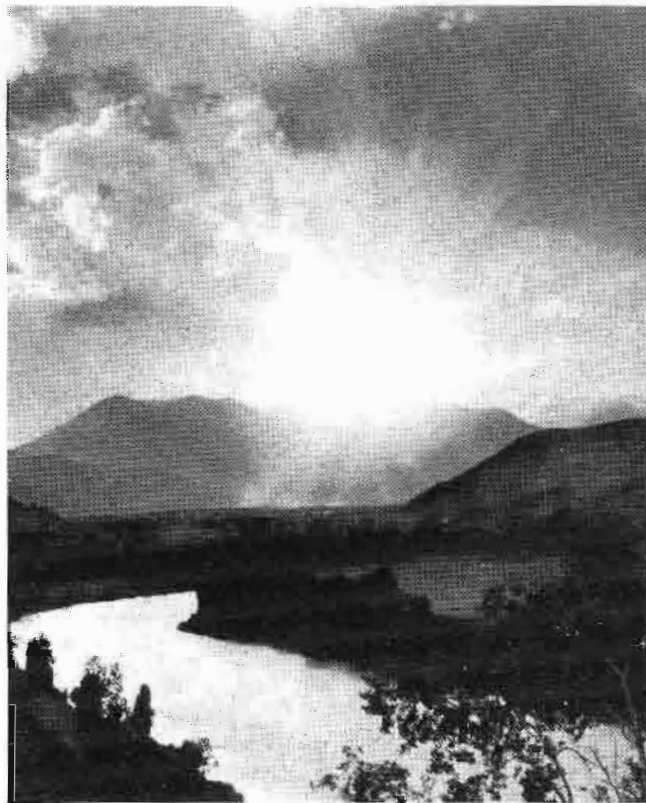


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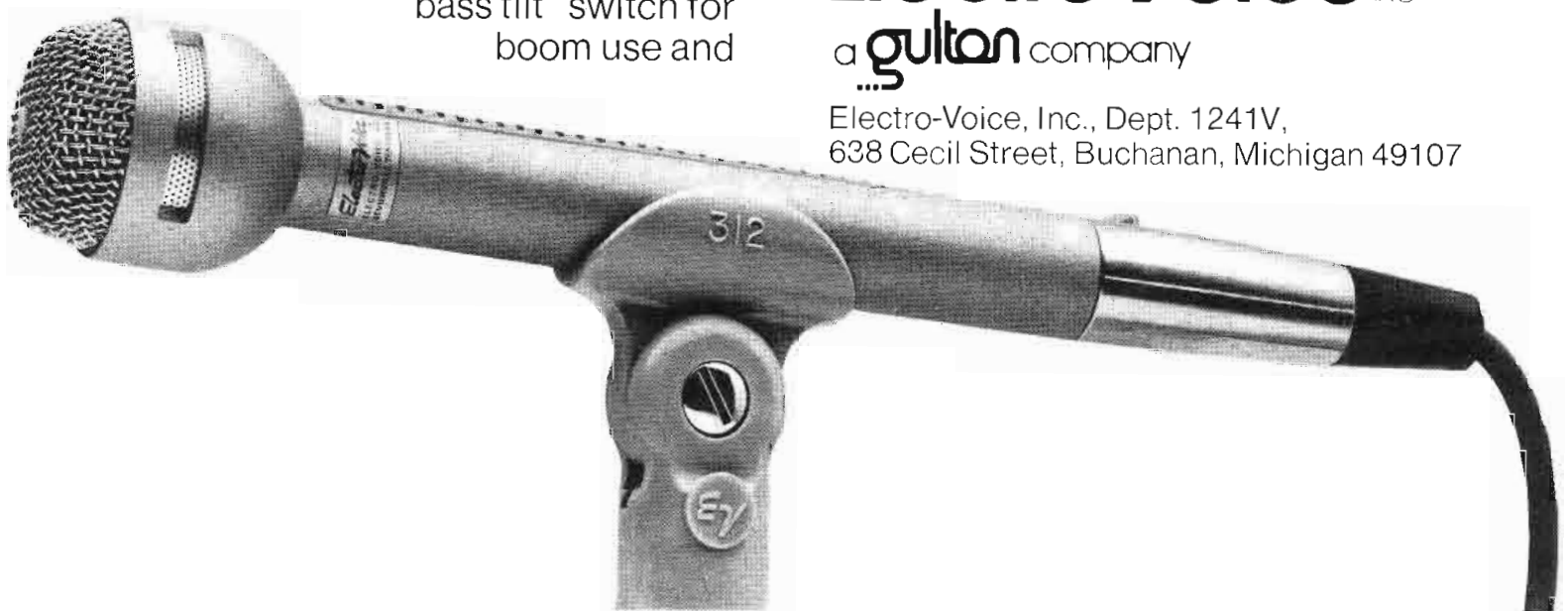
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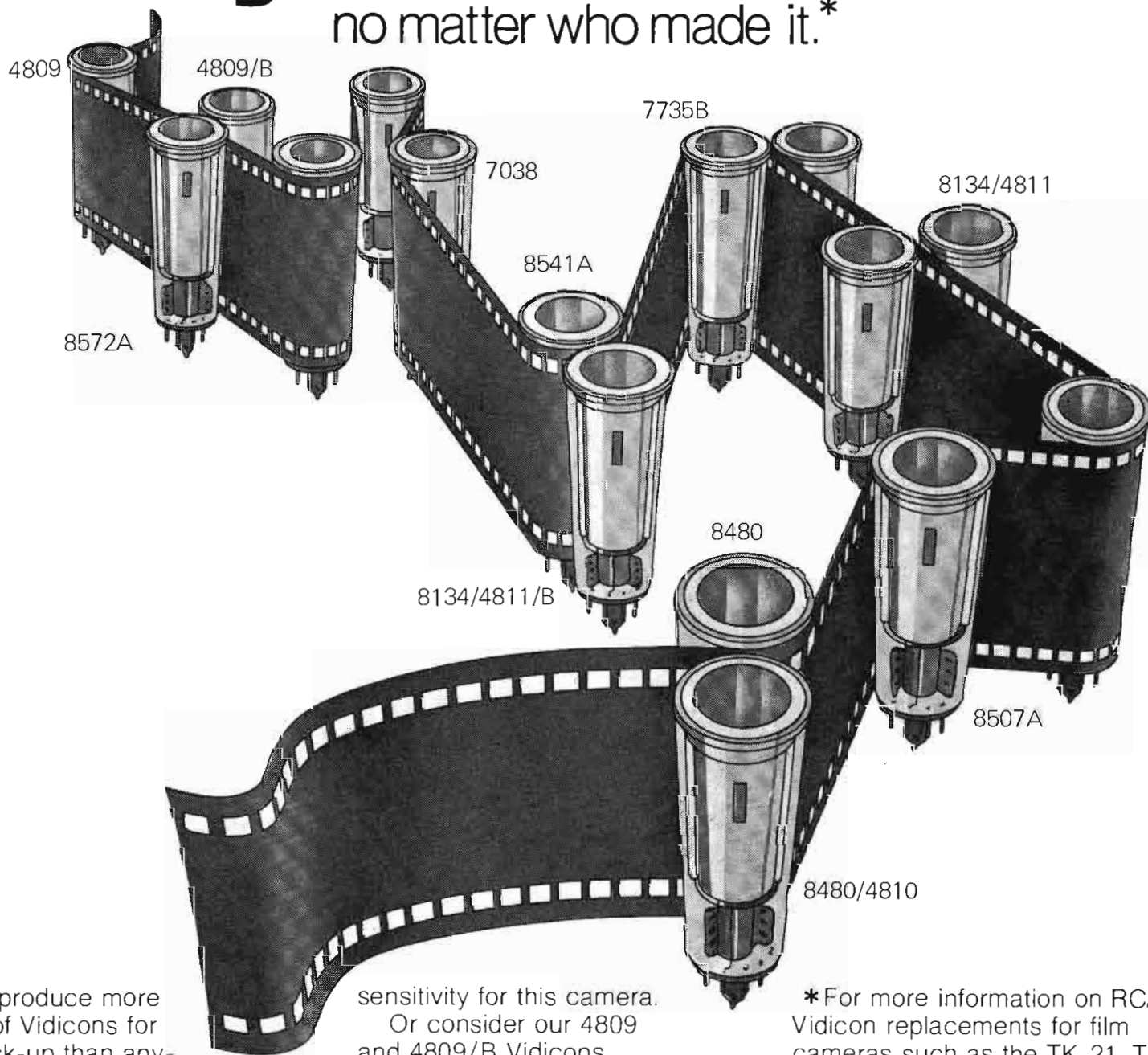
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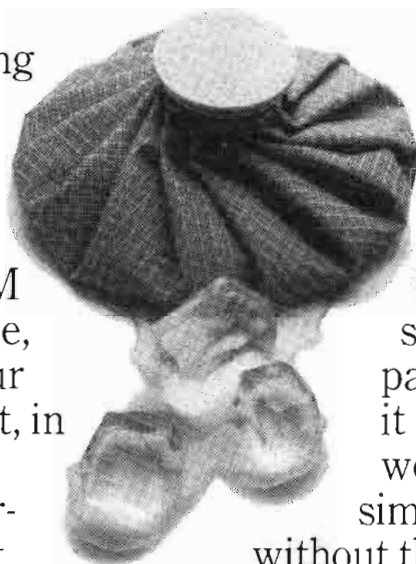
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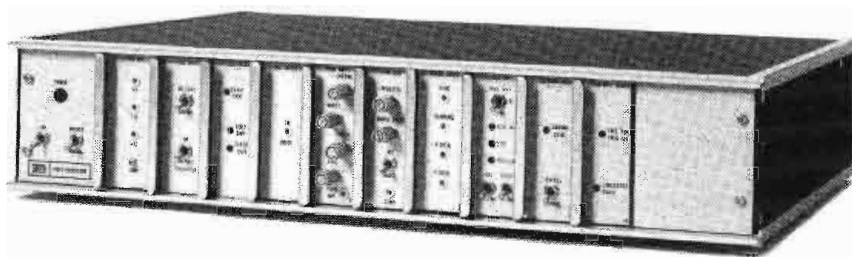
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# OSHA: Handle with Care

By Pat Finnegan

Where job safety was once a matter of common sense and good business, it is now a matter of law. The Occupational Safety and Health Act went into effect July 1, 1971, and is becoming more effective as states come on line with their own complementary statutes, adding more teeth and enforcement capacity.

Since the law came into being, much confusion has arisen over its application and workings. This

article hopes to cast some light on the scene.

Although the Act is directed at both the employer and the employee, it is the employer who is held responsible for providing not only a safe and healthful working environment, but also for employee compliance.

And when a hazard exists on a job, it is the highest ranking executive who has knowledge of its existence who is held responsible for lack of correction.

There is one important theme in

**CITATIONS**

- IMMINENT DANGER
- CITATION FOR SERIOUS VIOLATION
- CITATION FOR NONSERIOUS VIOLATION
- NOTICE OF DE MINIMIS VIOLATION

**Fig. 1** There are four types of citations given, depending upon the nature and seriousness of the condition.

**Management Highlights**

Here is another of those areas of station responsibility where the subject is not totally management or engineering. This report is based upon what is happening in Indiana. We suggest you check out your state requirements. Additionally, we want to hear from others in the field who have been affected by OSHA regulations. In this way, through **Broadcast Engineering**, we can take part in spreading the word that can make working conditions better while avoiding citations and fines that would disrupt the business and cut into revenues.

**PENALTIES-CIVIL**

VIOLATION	MANDATORY	FINE UP TO	AND/OR IMPRISONMENT UP TO
IMMINENT DANGER, WILLFUL OR REPEATED	NO	\$10,000/VIOLATION	NO
SERIOUS	YES	\$1,000/VIOLATION	NO
NONSERIOUS (ROUTINE)	NO	\$1,000/VIOLATION	NO
FAILURE TO CORRECT OR ABATE CITED VIOLATION	NO	\$1,000/DAY	NO
FAILURE TO POST CITATION	YES	\$1,000/VIOLATION	NO

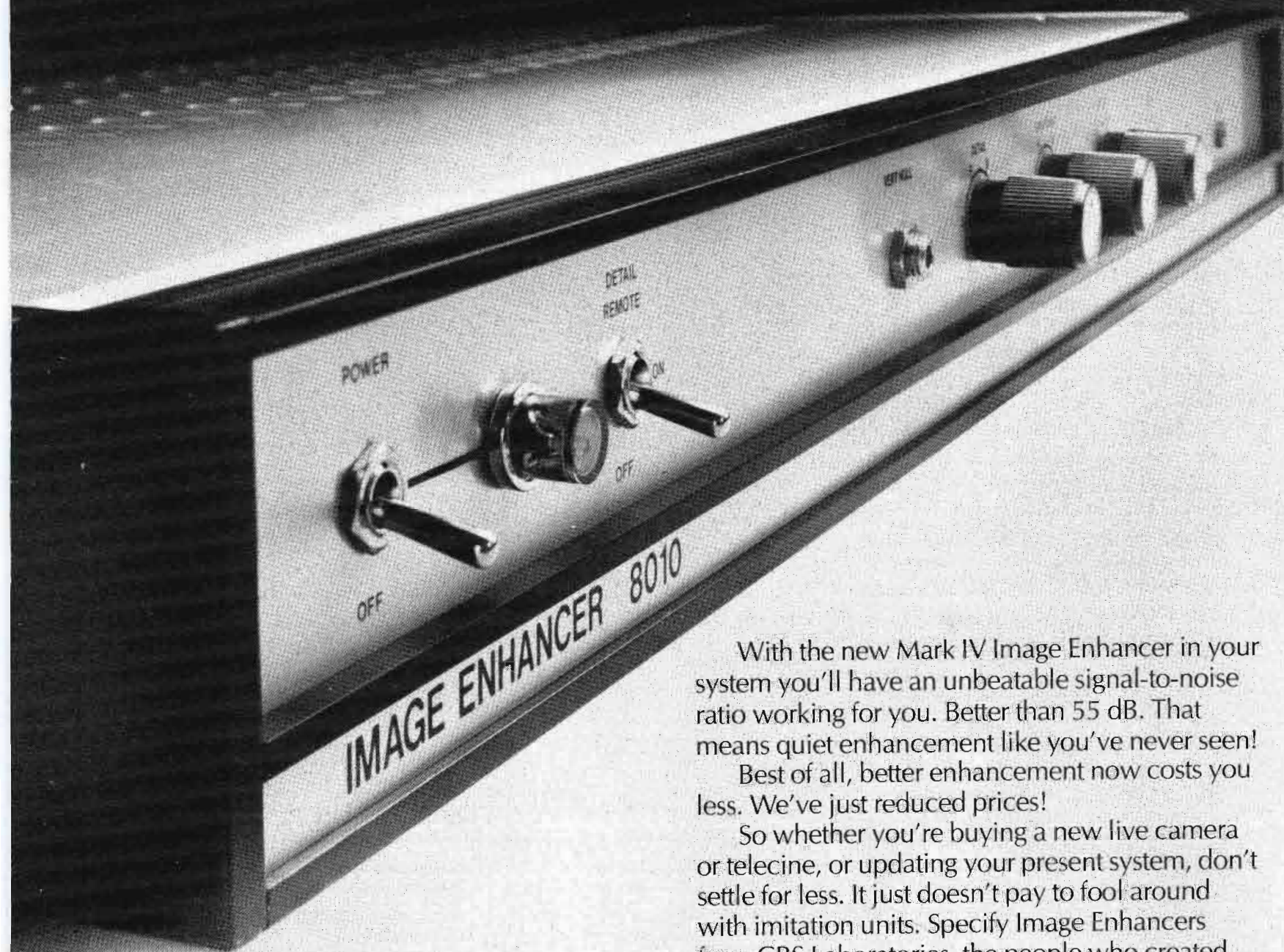
**PENALTIES-CRIMINAL**

WILLFUL VIOLATION RESULTING IN DEATH OF EMPLOYEE	YES	\$10,000/CONVICTION	SIX MONTHS
SECOND CONVICTION ON VIOLATION RESULTING IN DEATH OF EMPLOYEE	YES	\$20,000/CONVICTION	ONE YEAR
FALSIFICATION OF RECORDS	YES	\$10,000/CONVICTION	SIX MONTHS
UNAUTHORIZED ADVANCE NOTICE OF INSPECTION	YES	\$1,000/CONVICTION	SIX MONTHS
KILLING, ASSAULTING, RESISTING OSHA OFFICERS	YES	\$10,000/CONVICTION	LIFE

**Fig. 2** This chart shows that penalties can be both civil and criminal and that these penalties can be severe.



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this law, the employer-employee relationship should always be kept in mind. The employer is responsible for providing safe and healthful working conditions **only for his employees**, no one else. He is not responsible for outside contractors and others, unless their activities endanger his employees. Then, he must act to remove this danger **to his own employees**.

### Interesting Facets

The Act prohibits an advance warning that an inspection will take place, except for a few very specialized instances. Should the Compliance Officer give advance warning that he is about to make an inspection, **he** is subject to a fine of \$1,000 and 6 months in jail! Evidently, the writers of the law wanted the Inspector to see the job site just as it usually is.

There are at least three ways an inspection can be triggered: A work connected fatality or catastrophe will trigger an automatic inspection: An employee may file a written complaint with OSHA; Or, you simply may be next on the list. An Indiana Department of Labor representative has pointed out that there are about 90,000 industries and businesses in the state, and his department plans on inspecting each one of them. (The Indiana law went into effect in April, 1974, and in 3 years time, expects to have 89 Inspectors in the field.)

### Right Of Entry

An Inspector has the right of entry to any job site and if refused (or abused), he can get an immediate Court Order. (Such actions will incur additional fines and penalties.) He also has the right to privately interview any employee and can make an inspection any time during **normal working hours of the employees** — not the managers! Nor is it his job to explain how to correct any hazard he finds, but only to explain the standards and how he sees a particular situation at variance with the standards.

### The Standards

The Act requires the agency to develop industry safety standards. These are available on a subscrip-

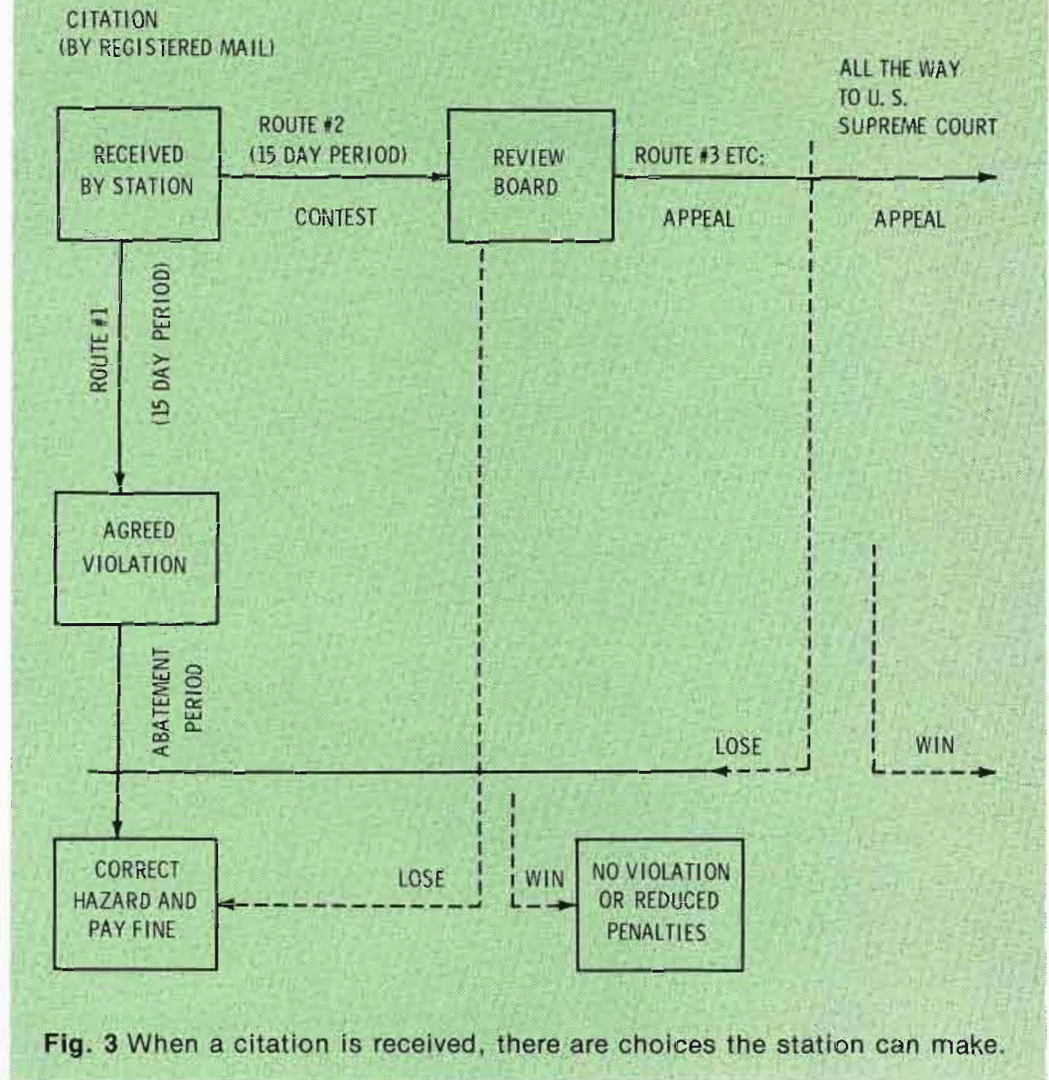


Fig. 3 When a citation is received, there are choices the station can make.

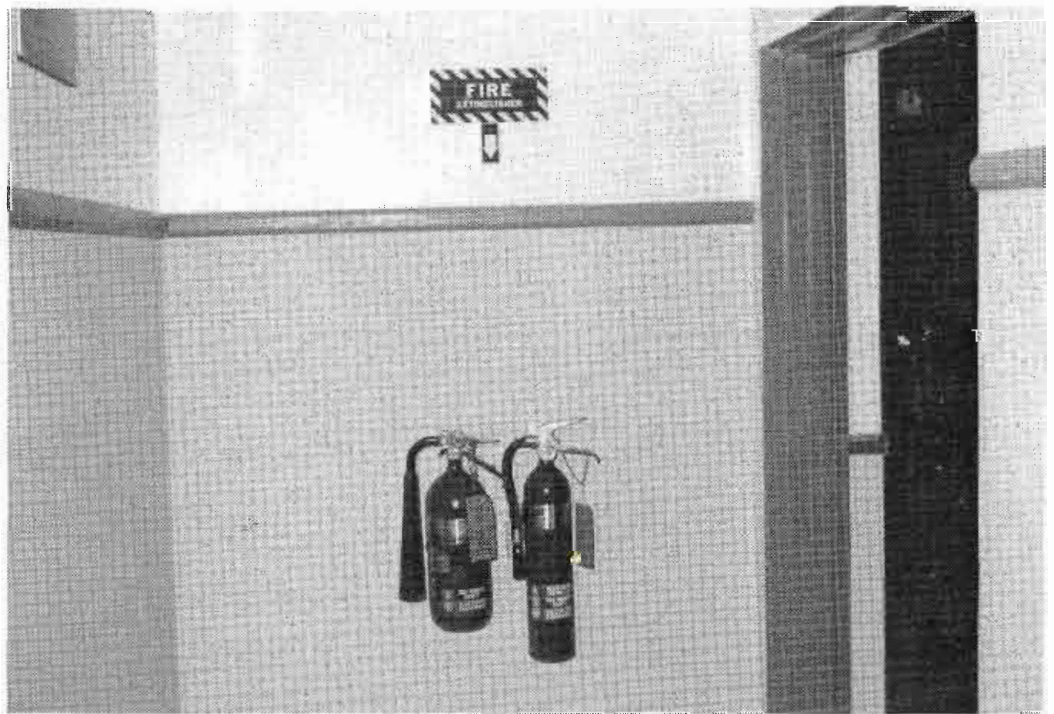


Fig. 4 Portable fire extinguishers must be properly marked, labeled, mounted at a convenient height, and inspected each month so that they are ready to use.

tion basis from the Government Printing Office (similar to the FCC Rules and Regulations). You may be interested in purchasing a set for your station. Order: Vol. I, General Industry Standards (\$21.00), Vol. IV, O.S.H.A. Regulations (\$5.50), Vol. V, Compliance Operations Manual (\$8.00). There are some

others but not of any special importance to the broadcaster.

### The Inspection

An Inspector will have an ID card (whether he is a Federal or a State man) which will have his photo on it and information on both sides of the card. **Ask for it**



**and read it! He expects you to do this.**

Generally, he will want to see your accident records, and he will note whether or not the OSHA poster is properly posted. If any of these are not up to date or non-existent, there will be an automatic fine.

The Compliance Officer will ask for a representative of the employer and a representative of the Union to accompany him on the tour of the facilities. If there is not union, **he will select** a representative of the employees for the tour. He will observe the general housekeeping, aiseways, exits, fire extinguishers etc., and will be alert for recognized hazards. (Recognized hazards are those which are recognized as such in your type of industry.)

He will have available and may use a variety of testing devices and may also take photographs of the

area where he finds a violation. For example, he has a device which can detect if that AC outlet in the wall is really grounded.

To close the inspection, there will be a conference between the Compliance Officer and the employer's representative. He will discuss any violations he has observed and an abatement period for correcting the hazard or hazards. A Compliance Officer does not levy penalties or collect fines!

### Citations

The Inspector will file his report, along with his observations of the general conditions prevailing and make his recommendations. Others at the District Office will review this report and decide if a Citation is warranted. You will hear from them shortly if a Citation is forthcoming. The law says "within a reasonable time period", but it also

has a limitation of 6 months.

A Citation will come by Registered Mail and you have 15 Government working days in which to contest it. A Citation is an indictment — not a judgement. If you believe you are right, you are expected to contest it.

A Review Board (which is outside the Dept. of Labor) will make the review if it is contested. If you still think you are right after the review hands down an unfavorable opinion, you have the right of judicial review all the way to the U.S. Supreme Court.

However, if you do not contest the Citation, after 15 days it becomes an agreed upon violation. You must then correct the hazard and pay the fine within the given abatement period. If there are valid reasons that the correction cannot be made in the allotted period of time, ask for an extension. The District Office must agree to an extension of time, or the original period stands. After the abatement period or its extension is past, you will receive another inspection. If the cited violation has not been corrected, you will receive additional and more severe penalties and fines.

### Penalties

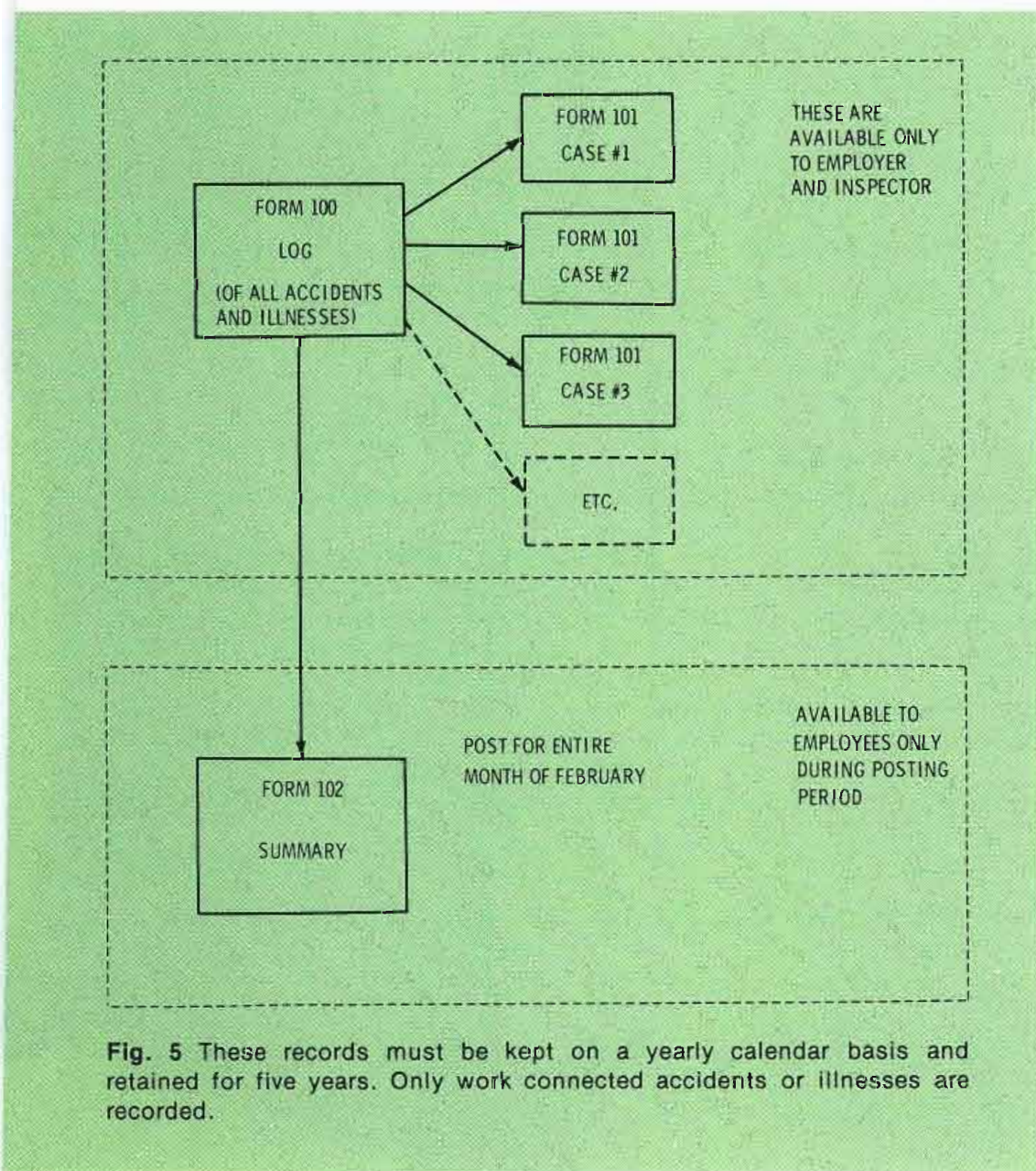
There are four different types of citations issued, depending upon the seriousness of the violation. There are: Imminent Danger, Serious, Non-serious, De minimis Citations. Each of these categories has a maximum fine that is possible, but is usually adjusted downward as the other conditions and attitudes on the job have a bearing.

There are some penalties which can also carry prison sentences for the individuals directly responsible. Thus, there are both civil and criminal penalties attached to this law.

### State Laws

The Federal Law encourages states to enact their own laws and take over the enforcement program. The Federal Government will fund, train, and assist the state agencies

(Continued on page 54)



**Fig. 5** These records must be kept on a yearly calendar basis and retained for five years. Only work connected accidents or illnesses are recorded.



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# The advantages and pitfalls of Gen-Locking

By Walt Skowron and Jim French\*  
\*Video Aids of Colorado

The term gen-lock has been misunderstood for many years. Its early application years ago brought about results that were unreliable and unpredictable.

New technological developments over the past few years have made significant improvements in gen-locking procedures and predictability.

Gen-lock, by definition, permits a local sync generator to "lock" to an external source of video, which could be a network, microwave or other remotely located source operating on its own sync generator source. This permits TV engineers and directors to lap (dissolve), title (mat), or split-screen over other incoming video. When taking to or from an external video source, interruptions of sync would not occur, as both incoming and local video would be synchronous. This means both vertical and horizontal would be locked together.

Many sync generators have some provision to adjust horizontal timing. When synchronizing to external color video sources, the 3.58 subcarrier is also locked to the external source and the phase of the color can usually be switched and adjusted through its entire 360° range.

## During Lock Up

When gen-locking most sync generators, they have to step up or down to lock to the external source. This can vary from a totally synchronous condition, showing no apparent picture change during the lock up, to an instantaneous short burst noise or glitch during the lock up process. This condition exists from the vertical which may lead or lag as far as a half frame. This problem should be anticipated before "gen-lock" is completed and before editing to prevent any picture (lock-up) disturbances from being recorded. Observing gen-lock video on a cross pulse monitor

reference to your sync generator before gen-locking would sync timing for good video recordings.

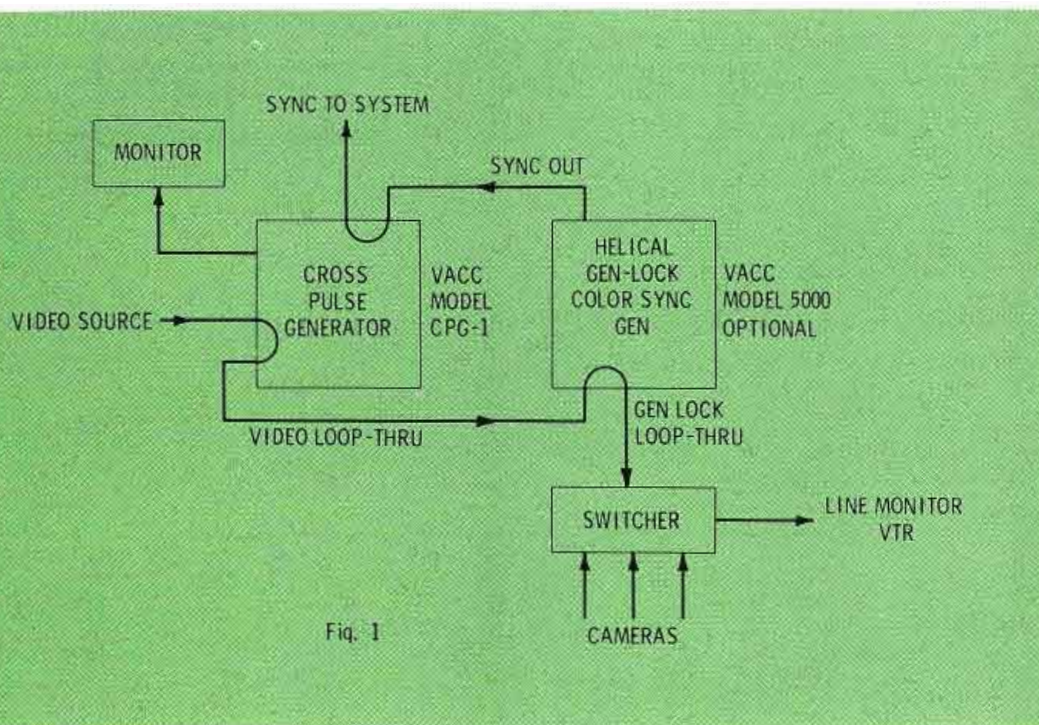
Gen-lock operation in RS-170 broadcast format is simple and all NTSC/RS170 gen-lock sync generators will follow and lock to these stable signals.

However, during the past few years, many types of video tape recorders are being used (2" helical, 1" helical, 3/4" cassette, 1/2" reel and 1/4" machines), which do not meet NTSC/RS170 specifications due to time base, tension and motor errors.

These VTR's have presented some new uses of video to educators, industry and even broadcast facilities. Yet, many of these VTR's are used for productions nearly as complex as those taped by major networks. Gen-locking to non-broadcast VTR's would permit takes, dissolves, wipes or mats from or to your VTR when your sync generator is locked to the operating machine. This would lock your cameras or other devices driven from your generator to the VTR or other source. However, gen-locking to these VTR's during playback presents several problems: time-base errors and tape tension errors cause sync discrepancies that cannot be followed by most NTSC sync generators. For a generator to gen-lock to these broad errors requires a design around the acceptance of many parameters, such as varying horizontal and vertical frequencies, horizontal delay problems and non-phased color signals.

The ideal gen-lock sync generator should be selectable for either input (NTSC or Helical), accepting either broadcast quality signals or any normal operating helical machine even in still frame.

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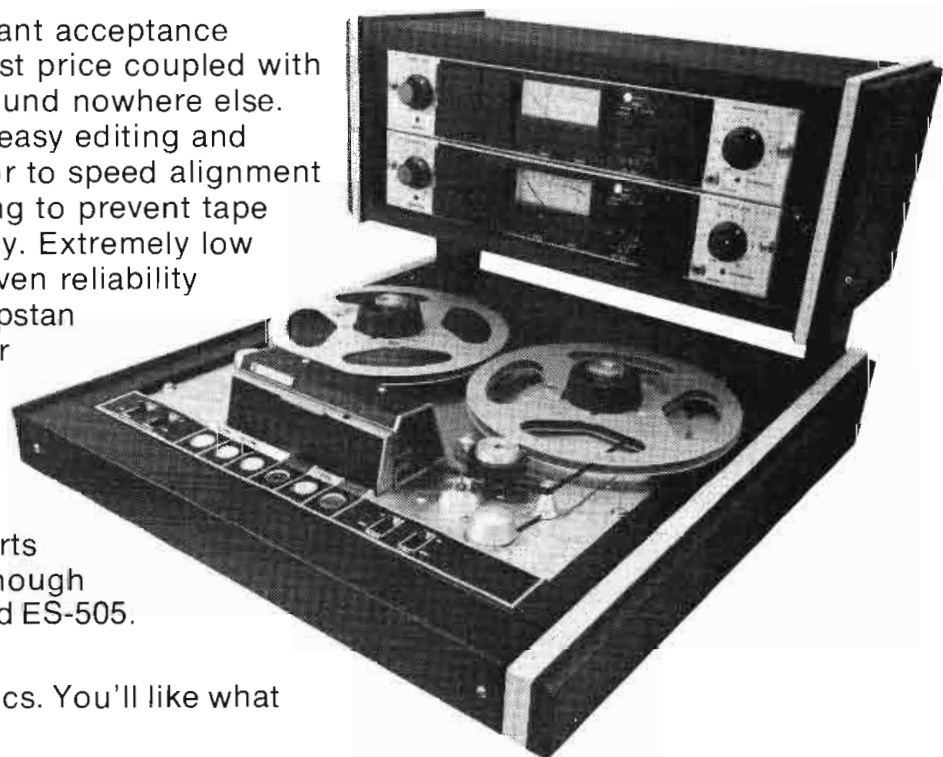
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Fig. A Cross pulse RS 170 without color burst.

Fig. B Cross pulse RS 170 with color burst.

NTSC/RS170 gen-locking sync generator should do the job. NTSC stability is an important specification. Pay close attention to short and long term stability, otherwise frequent calibration to the network or an external standard will be necessary in order to obtain successful gen-locks.

When gen-locking to a monochrome signal using color cameras, provisions should be available in the gen-lock sync generator to switch to normal internal subcarrier so the color cameras can be properly driven and locked.

For general purpose color and monochrome gen-locking requiring both NTSC/RS170 (10 Hz/30 days) and helical sources (up to 1 percent speed variations and 10  $\mu$ s skew), various models are available.

### Summary

Gen-locking is a process that permits a great deal of flexibility in

TV productions...even to using a porta-pack and then post-editing from such tapes.

Gen-locking to helical machines, b/w or color, although seemingly difficult, can now be easily accomplished due to new IC technology incorporated in sync generators that have a helical gen-lock mode, and utilize circuitry to compensate for skew, speed variations and head transition noise.

Gen-locking to NTSC/RS170 signals both monochrome and color have been achieved successfully over the last decade and once the technique is fully understood, few problems should be encountered.

### Obtaining Glitch-Free Gen-lock

Refer to Figure 1 and connect your video source through a pulse-cross generator. Position your exter-

(Continued on page 64)



# Tuning In....Or Out?

By Dennis Ciapura

From time to time we must stop and take a look at where we are if we wish to chart an accurate course to a successful future. With 1975 approaching, the time is ripe for a look at some of the problems that broadcast engineers are experiencing and form a "battle plan" for the coming year.

We're not talking about technical problems, at least not directly, but the day-to-day on the job difficulties related to small operating budgets, job pressures and inadequate monetary compensation in the face of escalating inflation. If you think that these are the same problems that just about everyone in the nation is facing, you're right, except that broadcast engineers seem to be suffering from a somewhat larger share of these ills than one might expect.

While the money problems usually apply more to people in the small and medium markets (the great majority) than to engineers in the large metro areas, certain job pressures and employer relations difficulties are almost universal. Let's take a closer look at each of the biggest areas of concern and see if any solutions are at hand.

One of the most widespread job pressures among engineers in our industry is the art of trying to "keep it legal" on an anemic engineering budget. While the station owner is responsible to the FCC for the legal operation of the facility, it is the chief engineer who sweats through an inspection. It is only natural, therefore, that the engineer should have a very real and personal interest in the legality of things around the station. If the antenna ground system is in need of \$2000 worth of repair work, it is usually the chief engineer who loses the most sleep over it. If the transmitter is limping along on soft tubes, it is the engineer's responsibility to come up with a legal Proof and sign **his** name to it.

Even if the equipment is all top notch, the station management is sometimes unwilling to spend the money to employ truly qualified operators. Often the man on duty is a graduate of a "six week wonder" mill who is a hundred times more concerned about the road to airway stardom than FCC regulations and technical responsibilities.

It would be unfair to label all combo men as technical incompetents, but I'll bet that a couple of thousand heads nodded as they read the last sentence.

Nothing can describe the ire that boils inside the chief who finds that an operator has allowed the transmitter to run at 110 percent power and not even attempted to lower it. Then there's the guy who logs nothing (and certainly checks nothing) for eight hours. If the chief engineer had hired the guy, at least he could blame himself for having made a bad choice, but the combo man is usually hired by the program director or general manager and presented to the engineering department after the fact.

Firing the operator usually is the same sort of affair. If he's a good announcer and will work cheap, it may be impossible for the chief to have him released. The operator usually knows this and so there is little incentive for cooperation. Once again, it is usually the chief who is getting the gray hair when the logs and transmitter parameters go awry.

## ***Ingrown Flexibility***

If the station is a new one just starting out, it is sometimes possible to get everybody doing the right things at the right times and even get in on hiring some truly capable people, but it is extremely difficult to straighten things out if the staff has been working haphazardly under the previous chief. The chief's only weapon is diplomacy, because he usually does not have

the power to hire and fire the combo men.

A similar problem arises when the chief inherits some ragged equipment: it's awfully hard to explain why a new modulation monitor is required when the station manager is relating how it has always been satisfactory before and how the previous engineer never had any trouble with it. The underlying cause behind all of these problems is money, an area where management is likely to be rather inflexible.

Facts are facts though, and the true and accurate legal condition of the station with respect to equipment and operating personnel **must** be communicated to the station manager. Gather the facts first and take the time to **write** a full report and keep a copy for your files. It is very important that you "put it in writing" for future reference and for your own protection if it ever comes down to the point of protecting your license. Some engineers are afraid of becoming unpopular with the boss for rocking the boat, but the truth of the matter is that a written report addressing specific problems is a sign of professional conduct of business and can only be respected.

The next step is to discuss the report. As a matter of fact it is a good idea to request a discussion at the end of the report. You may be surprised to find that the person that you are dealing with was unaware of the details of the problems and therefore did not understand the depth of the situation at hand. The fact that you took the time to write the report, in itself, lends importance to the problems. The meeting following the written report can very often result in the start of a positive plan of action to solve the problems. If it doesn't, try again in a few weeks. Even if success is a long time coming, at least you have copies of the written reports in your files to demonstrate your awareness of the problems and your action to correct them.

At any rate, the key to handling the situation is communication; person to person communication. All too often the chief will bear the burden of the station's problems inside of himself until the breaking point is reached and an uncon-



structive conflict often ensues. Getting all of the cards on the table relieves the pressure as well as increasing the chances for corrective action.

### The Economic Crunch

Another big problem area is one that concerns us all; salaries. Most small and medium market stations are one man engineering shows, with the chief engineer being the **only** engineer. As a matter of fact, he may even be the chief engineer of two or more stations. Salaries are determined in part by supply and demand, and in many parts of the country there is a good enough supply of engineering applicants to over-satisfy the demand, resulting in lower salaries. You will notice that we said engineering applicants, not necessarily engineers. Experienced broadcast engineers usually stay at one station for quite a while and aren't available too often. What really hurts the one man engineering staff is that his salary is not only lower than it should be to start with, but usually is relatively fixed with only token raises. An engineer may start with a company at a satisfactory salary and find that after a couple of years the cost of living increases have far out-paced his salary increases.

Broadcasting being the specialized field that it is, does not afford the engineer the opportunity to find another job very easily because there just aren't that many broadcast stations around and most of them only have a single engineer. So, if the engineer has a home in town and/or a family, he may not be mobile enough to scour the U.S.A. to find an opening in some other part of the country on two weeks notice. This is where the pressure comes in.

Being locked into a job that isn't paying can be a real exercise in frustration. Once again the best road to relief is communications. The current inflation makes this one a particularly difficult area to approach, but keeping ill feelings about ones salary a secret won't do anything except generate gray hair and ulcers.

All station managers appreciate a "can do" attitude, so, whenever possible try to do your utmost to act promptly and positively on requests for equipment repairs, etc.,

in an effort to create the right atmosphere for your salary discussion.

Try to negotiate without any threats of abandoning the ship, because negatives are generally counter-productive. Very often an employer who will not volunteer a raise will agree to an increase if you approach him and ask for one. Prepare your case in advance so that you can present an intelligent defense of your request. Lean more toward why you are worth more money rather than dwelling solely on what you need more money for. Many engineers resent not being

given an increase without asking for it and harbor ill feelings toward the employer without ever asking for a raise to see if one can be obtained. This is unfortunate because one must remember that **the station manager is also under a great deal of pressure to make ends meet in today's difficult economy.** This is particularly true if the station manager is not the sole owner and must report to the board of directors: **It's a lot easier to report that the chief engineer requested a salary increase, which was granted, than to report that an increase was volunteered.**

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When it comes to voice logging, the slower the better. The more tape you use, the more money you spend. Our new 400 Logging Recorder is not only slower and better, but, when teamed with our 4400 Time Code Generator, also surer.

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# Simplifying digital math

## Part 4 of a series By Harold Ennes

You have positive and negative values in binary notation just as in base 10 arithmetic. It's time now to consider the binary scheme of manipulating either polarity in calculations. You will find binary subtraction by "complements" much simpler than the straight arithmetical method described earlier.

### Solutions To Exercises For Part III

- (a) 1000 0010 0101  
(b) 0111 1000 0110  
(c) 0010 0010  
(d) 0001 0000
- (a) Convert 16 to binary:  

Positional weight:	32	16	8	4	2	1
	↓	↓	↓	↓	↓	↓
binary:	0	1	0	0	0	0
	⏟		⏟			
octal:	2		0			

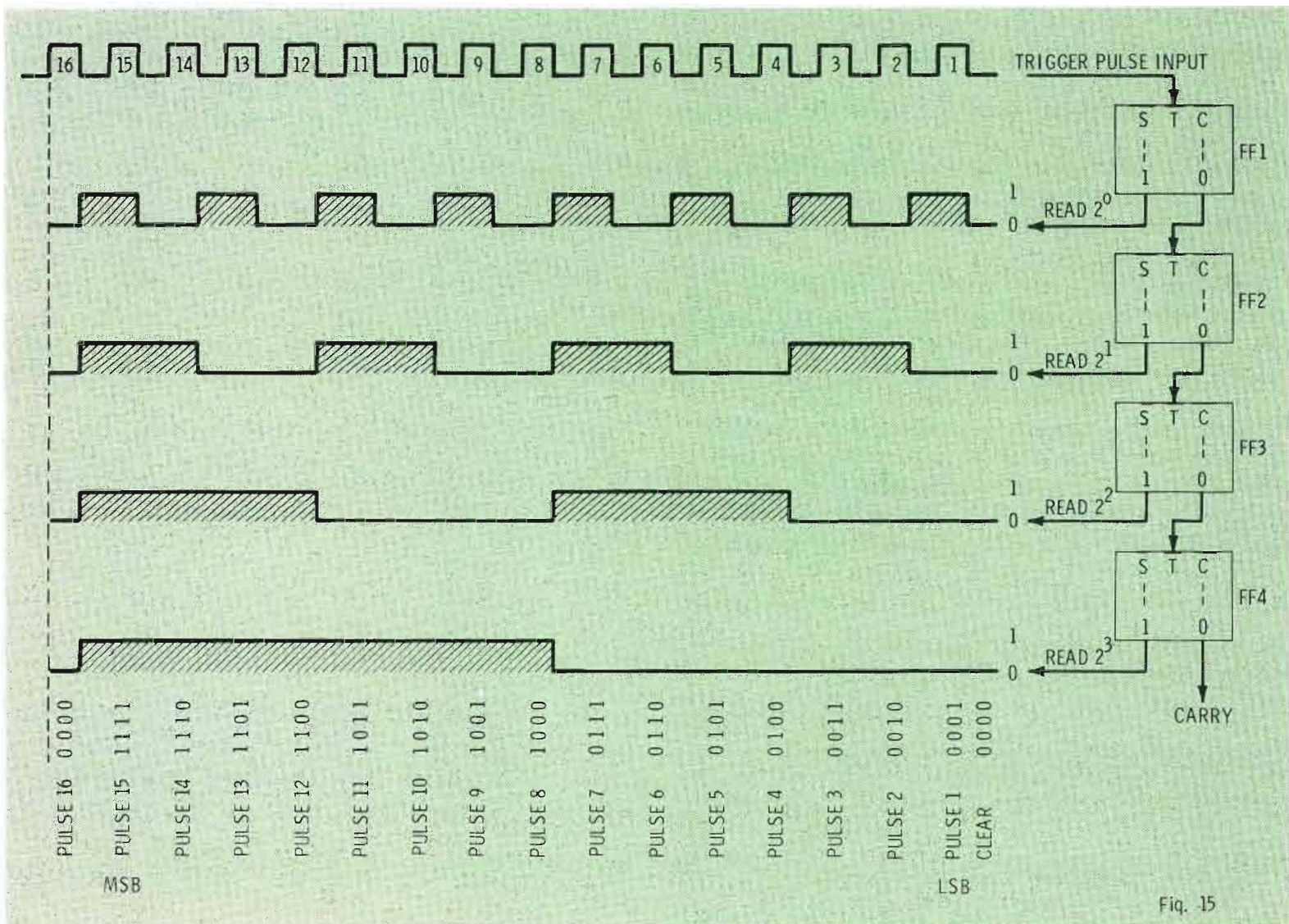
answer: decimal 16 = octal 20  
(b) Answer is 13.

- binary:  $\frac{011}{3} \frac{111}{7} \frac{111}{7} . \frac{110}{6}$   
octal:  $\frac{3}{3} \frac{7}{7} \frac{7}{7} . \frac{6}{6}$
- octal:  $\frac{5}{5} \frac{6}{6} . \frac{1}{1}$   
binary:  $\frac{101110}{32+8+4+2} . \frac{001}{0.125}$   
decimal:  $32+8+4+2+0.125 = 46.125$
- decimal 653.1875 = binary 1010001101.0011 (review Figure 8)

### The "Modulus"

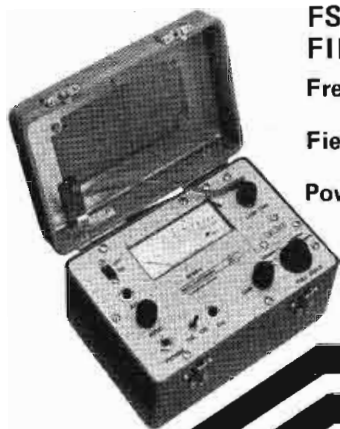
The odometer (mileage indicator) in your automobile normally has a decimal readout capacity of 99,999.9 miles. When you travel another 1/10 mile, the odometer "resets" or "clears" to 00,000.0 which actually represents 100,000 miles. Therefore, for this device, the **modulus** is 100,000. The modulus of any counter is the fixed capacity of the counter **plus one** increment of the least significant digit (LSD).

Thus a 4-bit binary has a fixed capacity of 15, so a modulus of 15+1=16. Observe Figure 15 and the following analysis. (**NOTE: Read from right-to-left so that the least significant digit is on the right for convenience**).





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Sixteen "triggers" are shown feeding the "toggle" (T) input of FF1. Assume that when the flip-flop is in the set (S) state, the 1 side of the FF reads 1 (high level), and the 0 side reads 0 (low level). If the circuit is in the clear (C) or reset state, the 1 side reads 0 and the 0 side reads 1. Further assume that this series of flip-flops can be "reset" (cleared) so that all 1 outputs are 0 simultaneously. After this, when the clear (C) side changes from the 0 state to the 1 state, (1 to 0 on the set side), a pulse is sent to the input of the next higher order.

**Prior to pulse 1:** All four FF's are in the clear state; each output reads 0 and the total counter output is 0000.

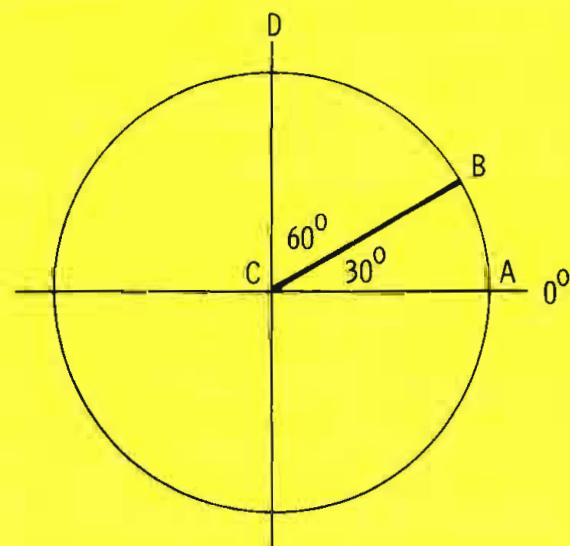
**Pulse 1:** Changes FF1 to the set state, producing a 1 at the set output. However, neither FF2 nor any of the following stages receives a signal because FF1 produces a pulse at its clear (C) output only when changing from the set state to the clear state. Note that the counter output is now 0001.

**Pulse 2:** Changes FF1 from set to clear (reset), producing a 0 at the set output and a 1 at the clear output. The C output pulse changes FF2 from the clear to the set state (the S output of FF2 now reads 1). The clear output of FF2 is 0, and remaining flip-flops are not affected. The total counter output is now 0010, or binary notation for decimal 2.

**Pulse 3:** Changes FF1 to the set state again, but following FF's remain in the previous state. The output is now 0011.

**Pulse 4:** Changes FF1 and FF2 to the clear state, and FF3 to the set state. We now have 0100.

If you continue this analysis, you find that the circuit will count up to 15 pulses and then return to clear (0000) on the sixteenth pulse. The highest possible binary number is 1111, or 15. The modulus of



TO COMPLETE AN ANGLE OF  $90^\circ$ , THE ARC BD IS THE COMPLEMENT OF ARC AB, OR THE ANGLE BCD IS THE COMPLEMENT OF ANGLE ACB, OR THE COMPLEMENT OF  $30^\circ$  IS  $90 - 30 = 60^\circ$

Fig. 16



this counter is  $15+1=16$ . In binary form:

$$\begin{array}{r} 1111 \quad (15) \\ + 0001 \quad (1) \\ \hline = \underline{1}0000 \quad (16) \end{array}$$

This tells you that on the sixteenth pulse, a 1 exists (underlined above) at the "carry output" (C of FF4) so that an additional FF5 would count this pulse. Otherwise, the counter is simply in the "clear" position and ready to repeat counting on the seventeenth pulse.

### The Fascinating "Complement"

A "complement" is that quantity or amount which, when added to a given quantity completes a whole. For example, in Figure 16, if you want to complete an angle of  $90^\circ$ , the arc BD is the **complement** of arc AB, and the angle BCD is the complement of the angle ACB. Another way of saying this is that, for an angle of  $90^\circ$  as a whole, the complement of  $30^\circ$  is  $90 - 30 = 60^\circ$ .

Thus the complement of  $460 = 1000 - 460 = 540$ . The complement of 25 is  $100 - 25 = 75$ .

Note in each case that the arithmetical complement is actually the **difference** between a number and the power of the base next in series. When you complement a number, it becomes a **negative** value, and the complement is a **positive** number. Synonyms for the "complement" are: inversion, reversal, the opposite, the reverse, the inverse, the converse.

In conventional arithmetic, suppose you subtract 235 from 485:

$$\begin{array}{r} 485 \quad (\text{minuend}) \\ - 235 \quad (\text{subtrahend}) \\ \hline = 250 \quad (\text{answer}) \end{array}$$

You can do the same thing by **adding** rather than subtracting if you complement the subtrahend and continue as in normal addition:

$$\begin{array}{r} 485 \quad (\text{minuend}) \\ + 765 \quad (\text{complement of subtrahend}) \\ \hline \underline{1}250 \quad (\text{answer with } \underline{1} \text{ overflow}) \end{array}$$

In complementary arithmetic, the most significant digit is not a part of the answer numerically (1 in the above example) and the answer (250) remains.

Let's see what happens if you have a result which is a negative number rather than a positive number. Suppose you have  $235-485$ . Normally you simply subtract the smaller number from the larger number and affix the sign of the larger number to the answer. Hence  $-485+235=-250$ .

In complementary arithmetic:

$$\begin{array}{r} 235 \quad (\text{minuend}) \\ + 515 \quad (\text{Complement of a negative number is positive}) \\ \hline = 750 \quad (\text{Complement of } 250) \end{array}$$

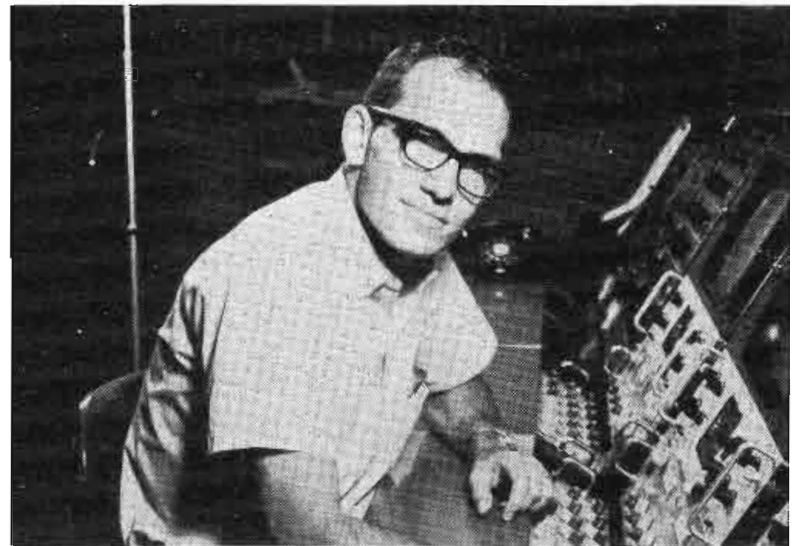
Hence re-complementing  $750 = -250$  (answer). The complement of a complement is the original number.

Simply note from this example that when a resultant is a negative number, it will be indicated by the appearance of the complement form in the answer. The answer is then re-complemented to get the correct negative value.

### Binary Complements

Complements in binaries are much simpler than

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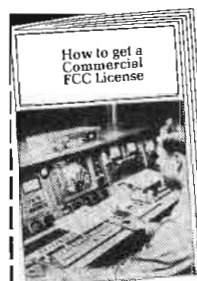
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conventional complementary arithmetic. To complement a binary, simply invert the number (change all zeroes to ones and all ones to zeroes), then ADD 1 for the modulus of the counter. For example, to complement binary 0010 (decimal 2):

$$\begin{array}{r} 1101 \text{ (inverted 0010)} \\ + \quad 1 \text{ (add 1)} \\ \hline 1110 \text{ (complement of 0010)} \end{array}$$

Remember that the modulus for a 4-bit numbers is  $15+1=16$ . Thus the complement of 2 in this system is  $16-2=14$ =binary 1110 as derived above.

**NOTE: The inverted number is sometimes termed the "ones complement"; then when 1 is added, the term is "two's complement."**

Now consider the addition of 0110 and -0100 (decimal 6-4). Simply complement the negative number (gives a positive number), then add the result to the positive number as:

$$\begin{array}{r} 1011 \text{ (inverted 0100)} \\ + \quad 1 \text{ (add 1)} \\ \hline 1100 \text{ (complement of 0100)} \end{array}$$

Then add this complement to 0110:

$$\begin{array}{r} 0110 \\ +1100 \\ \hline 10010 \text{ (ans)} \end{array}$$

Now you discard the overflow digit (MSD) and replace it with either a plus or minus sign. If the MSD is 1, the sign is plus. If the MSD is zero, the sign is negative. In the above example, the MSD is 1, so your

answer is +0010, or decimal 2. This satisfies the condition of  $6-4=2$ .

When a negative number is added to a smaller positive number, the overflow (MSD) is always 0, and the answer is negative. When the result is negative, the number must be **recomplemented** to obtain the correct solution. For example, add -1001 (decimal -9) to 0010 (decimal 2). First find the complement of 1001:

$$\begin{array}{r} 0110 \text{ (inverted)} \\ + \quad 1 \text{ (add 1)} \\ \hline 0111 \text{ (complemented)} \end{array}$$

Now add this to 0010:

$$\begin{array}{r} 0111 \\ +0010 \\ \hline 01001 \end{array}$$

Since the MSD is a 0, we discard it and write a negative sign to get -1001. Now to **recomplement**:

$$\begin{array}{r} 0110 \text{ (inverted)} \\ + \quad 1 \text{ (add 1)} \\ \hline 0111 \text{ (negative answer)} \end{array}$$

Thus the answer is -0111. This is decimal -7 which results from adding -9 to +2.

Binary subtraction by complements is exactly the same as addition of positive and negative binary numbers. For example, subtract 0011 (decimal 3) from 1111 (decimal 15). First find the complement of 0011:

$$\begin{array}{r} 1100 \text{ (inverted)} \\ + \quad 1 \\ \hline 1101 \text{ (complement)} \end{array}$$



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Then add:

1111  
1101

11100 = +1100 = decimal 12

### Exercises For Part IV

Since the concluding Part V of this series will be concerned entirely with new Practice Problems and Solutions, we will complete exercises for this Part IV by following this section directly with the solutions. Try to solve each problem on your own before going on to the solutions at the end of this Part.

1. What is (a) The maximum count of an 8-bit pure binary?  
(b) The modulus of an 8-bit pure binary?
2. What is the complement of binary 1110?
3. Find the sum of: (a) 1011+(-0011)  
(b) 1111+(-1010)
4. Find the difference of: (a) 1010-0100  
(b) 0011-0110

### Solutions To Exercises For Part IV

1. (a) 11111111 or 128+64+32+16+8+4+2+1=decimal 255

(b) 11111111  
+ 1  
100000000 = +256 decimal

2. 0001 (inverted 1110)

+ 1  
0010 complement of 1110. (This is 16-4=2 decimal form of complementary arithmetic)

3. (a) 1100 (inversion of 0011)

1  
1101 (Complement of 0011)  
add: 1011  
1101  
11000 = +8

- (b) 0101 (inversion of 1010)

+ 1  
0110 (complement of 1010)  
add: 1111  
0110  
10101 = +5

4. (a) 1011 (inversion of 0100)

+ 1  
1100 (complement of 0100)  
add: 1010  
1100  
10110 = +6

- (b) 1001 (inversion of 0110)

+ 1  
1010 (complement of 0110)  
add: 0011  
1010

01101 = -1101 (must be recomplemented)  
recomplement: 0010 (inversion of 1101)

+ 1  
0011 = -3

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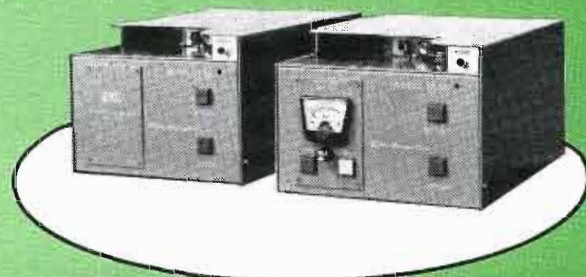
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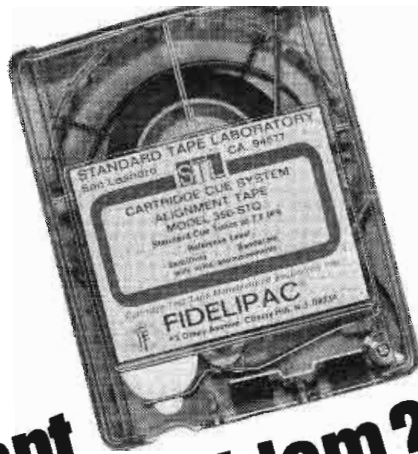
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and will monitor their operations for three years. To obtain Federal approval, not only must the state agency perform to the Federal Agency satisfaction, but the State Statutes must be as least as severe as the Federal Law (preferably, also cover these areas exempted in the Federal Law). After the 3 year monitor period, the state will do most, if not all, of the enforcement within its boundaries, but the Federal Agency reserves the right to reassert jurisdiction if the state performance wanes.

During the monitoring period, you can be inspected by either agency (but not usually both at the same time). If a penalty or fine is levied against you for a particular violation, it will come from one agency or other but not both. That is, there is no double jeopardy. The Federal Agency will issue a Citation, but the state may call it something else. (In Indiana, it is a Safety Order). Regardless of what it is called and who sends it, it has the same meaning.

### Records

There are three separate forms which must be kept up to date: forms 100, 101 and 102. (But states may require additional forms or additional information.) These are records of work connected injuries or illnesses. Form 100, is the log of injuries, while form 101 is the supplementary record. This form details each case that is listed on the log. That is, there will be one form 101 for each case entry on the log. Form 102 is a summary of all the accidents or illnesses. These forms are kept on a yearly calendar basis (Jan. 1 - Dec. 31). These records must be retained on file for 5 years.

In the month of February following the close of the year, the summary (form 102) must be posted where all employees can readily see it, and it must be kept posted for the entire month.

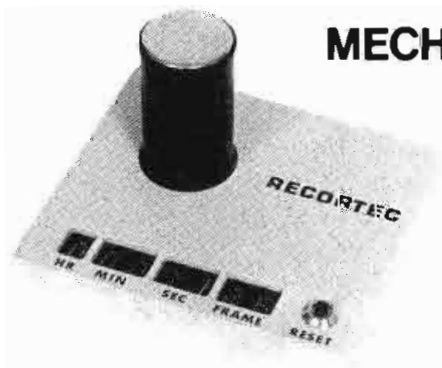
As of now, you should have on file completed forms that date back to July 1, 1971. If the earlier ones are missing or incomplete, reconstruct these incomplete forms from other records (such as Workman's Compensation Records, etc.). But make a notation on the form that it has been reconstructed from other records. You don't want to be caught falsifying records!

There is a regulation that requires all portable fire extinguishers be checked at least once a month so that they are ready for use. No records are required of this, but you must demonstrate somehow that this is being done. Set up your own checklist and record so that this can be used to demonstrate you are performing this monthly inspection.

### Information

The National Safety Council through its local offices, can provide you with information on OSHA. Also, for information and forms, you can contact the District Office of the U.S. Dept. of Labor. For information on state laws, contact your State Department of Labor. And, of course, there is the Government Printing Office with its many publications and the earlier mentioned subscription service.

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## Console Roundup

(Continued from page 24)

turn on other equipment; four mixing busses are Program, Audition, Utility and Monaural; all functions are fully metered, with five meters standard; monitor 25 Watts per channel RMS.

Options include: slide-or rotary precision step attenuators; Digital Clock; one or two 6-mixer Extender Panels; Peak Program Meters in place of VU meters.

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### Quad-Eight Production

Quad Eight Electronics offers custom system design and manufacturing in a wide variety of model types to meet applications where the operational and performance criteria will not be achieved by a standard design.

Configurations include: up to 50 mic or line inputs, extensive multi-band equalization and filtering, Voltage-Controlled system design which allows flexible audio subgrouping and programmable interfacing, up to 32 outputs, peak or VU alternate monitoring in an extensive and separate console monitor section, unlimited logic facilities for machine controls, and electronic performance characteristics in all specifications which meet or exceed the highest standards attainable in the professional audio field.

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### McCurdy Radio Stereo

McCurdy offers a complete roundup of the latest in electronic and physical design in consoles for AM, FM, and production work.

Their consoles can be interfaced with an automation system. They include remote control of reel, turntable and cart machines, switchable AGC control on all mic mixers. The package approach that McCurdy takes includes a program routing switcher to delegate audio from two production centers and automation racks to telco lines, equalization can be delegated to

(Continued on page 56)

### Consoles Continued

Console manufacturers not covered in this issue will be included in Part II, which will appear in the January issue of BE.

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# Console Roundup

(Continued from page 55)

any mixer or program channel. Included are tone and digital information generators which are used in the production of tapes and cartridges for playback in automation systems.

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## Ramko Series 35

Ramko's series 35 introduces a new concept in console versatility. Due to its completely DC controlled design the unit may be used in a standard table top configuration, rack mounted or custom applications. In addition, since only DC is used to control the audio functions (mixing & switching) in the main frame, any combination of rotary, slide or pushbutton faders may be used. Also any physical grouping or arrangement of the controls may be utilized without worry of hum pickup and ground loops.

Features include: 8 channels, mono, dual channel mono, stereo, dual channel stereo, fail safe power supply and plug in interchangeable cards.

Performance specifications are: 0.3% or less distortion, 124dBm equivalent noise on low level channels, approximately 25 Watts power consumption, -70B crosstalk, balanced bridging/matching inputs and response within  $\pm 2$ dB 20Hz-20KHz.

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## Sunn Magna 5000 Series

Up to 24 channels in with 9 channels out; 3 buss sends, selectable pre or post of main fader; lighted cue system; -10, -20dB microphone padding plus up-to-40dB of gain attenuation on each channel; LED level and peak indicators; individual low, mid, and high frequency equalization on each channel; 22.2dB of headroom throughout; switchable to line input. System is ideal for sound reinforcement mixing and/or live recording on location, and is supplied with permanent tramping case.

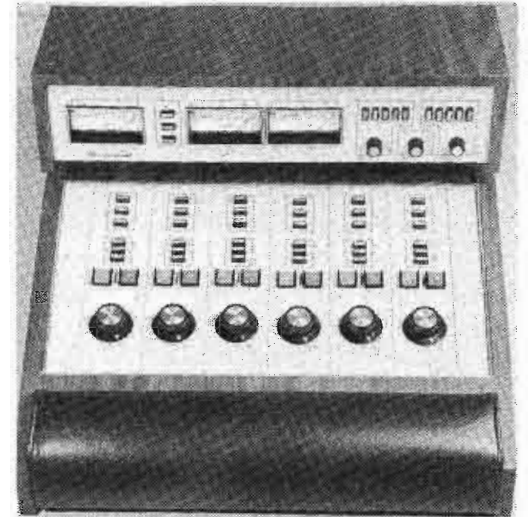
One octave, nine band graphic equalizer; mono/stereo selectable, five band electronic crossover; 4 channel quadrasonic panner; talk back and intercom module (up to 30 stations); multiple 600 Ohm balanced line transformer module.

For More Details Circle (89) on Reply Card

## Sparta Prod. Room Centurion

The Sparta Centurion III is a monaural 6-mixer console of 18 inputs.

Features include: three identical mixing busses are Program, Audition, and Utility; Audition selectable to feed audio to any of three locations; identical electronically to Centurion I and Centurion monaural Extender Panels.



Options include: slide or rotary precision step attenuators; Peak Program Meters in place of VU meters.

For More Details Circle (90) on Reply Card

## Sparta Centurion I

The Sparta Centurion I is a monaural 8-12 mixer console, with three inputs per mixer in any configuration. It accepts one or two 6-mixer Extender Panels, so that total flexibility is 24-mixers, 72-inputs.

Features include: identical, interchangeable mixer modules; modules switch selectable for hi-med-low level inputs, which automatically select input impedance; noiseless optically-isolated audio switching; external switches turn mixer modules on & off; Form A contacts from console turn on other equipment; three mixing busses are program, Audition, Utility; intercom of 5 Watts provided; all functions fully metered with 'black-out' VU's.

Options include: slide or rotary precision step attenuators; Digital Clock; one or two 6-mixer Extender Panels; Peak Program Meters in place of VU meters.

For More Details Circle (91) on Reply Card

## Spectra Sonics Model 1024-24

The Spectra Sonics Model 1024-24 audio control console has performance that is guaranteed. The functional design and clean lines are combined in a console which aids the profession-

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For More Details Circle (43) on Reply Card



al competence of the broadcast facility. This audio control system is available in various configurations up to 24 inputs and 24 outputs.

The Spectra Sonics Model 1024-24 features: modular construction; quad panning on all inputs, and echo return; eight sub-mix busses; three cue busses; microphone/program equalizer with fifteen frequencies; improved monitor mixing; separate quad busses; stereo and mono busses.

Spectra Sonics Model 1024-24 is in full production and is available now.

For More Details Circle (92) on Reply Card

## Sphere Alpha 8-Input

Sphere Electronics' console is actually a small console that includes features usually found only on larger consoles such as the Sphere Eclipse. The Alpha can be used in production houses and broadcast studios for production work.

Features include echo and program pan pots, plug-in preamps, talkback with mic, studio and control room monitor, and built-in tone oscillator.

Distortion, THD: below .2% up to +24 dBm output. Noise: -127 dBm equivalent input signal, 20 Hz - 20 kHz unweighted. Frequency response: within +1dB 20 Hz - 20 kHz.

For More Details Circle (93) on Reply Card

## Spotmaster Model 8BES-200

The Broadcast Electronics dual channel 8BES-200 provides identical performance stereophonic audition and program channels with a composite mono output derived from the program channel. All mixing channels are switch selectable for microphone or line level sources. A mono input can be fed to both left and right channels by the mono/stereo selector switch on each preamplifier. Left/right balance is adjustable for the program, audition, and mono outputs. Mixers are stereo step attenuators. Connections are made to screw terminals inside the cabinet. The power supply is intenal.

For More Details Circle (94) on Reply Card

## Spotmaster Model 4BEM-50

The Broadcast Electronics monaural 4BEM-50 is a complete small console available in rack or table mount versions. Each mixer accepts two switch selectable inputs; each preamplifier is strappable for microphone or line level inputs. Separate cue, headphone, and monitor amplifiers are built-in. The headphones may monitor the out-

put, cue, or an "off-the-air" signal. The internal cue speaker and monitor speaker outputs are connected through a muting relay. Customer strapping allows relay control by any input. A heavily filtered power supply is built-in. All connections are made to screw terminals inside the cabinet.

For More Details Circle (95) on Reply Card

## Spotmaster Model 5BEM-100

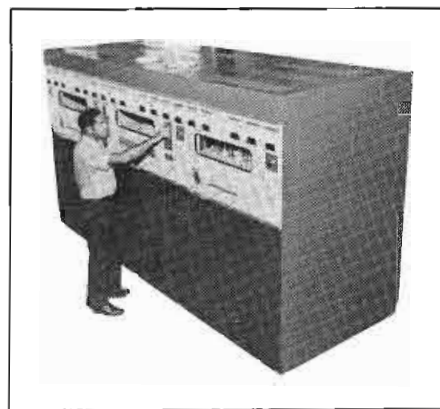
The Broadcast Electronics monaural 5BEM-100 dual channel console features separate identical amplifiers for the audition and program channels. Quiet switching of mixers is insured by the use of FET circuitry; only a control voltage appears on the channel selector switch for each mixer. All mixers accept microphone or line level inputs as selected by internal switches. Mixers are long-life sealed units or optional step attenuators. Separate monitor, headphone, and cue amplifiers are provided. All amplifiers and preamplifiers are plug-in modules.

For More Details Circle (112) on Reply Card  
(Continued on page 58)

For Latest News  
See  
Direct Current page 4

## QUALITY TALKS FOR WNEW

New York, New York



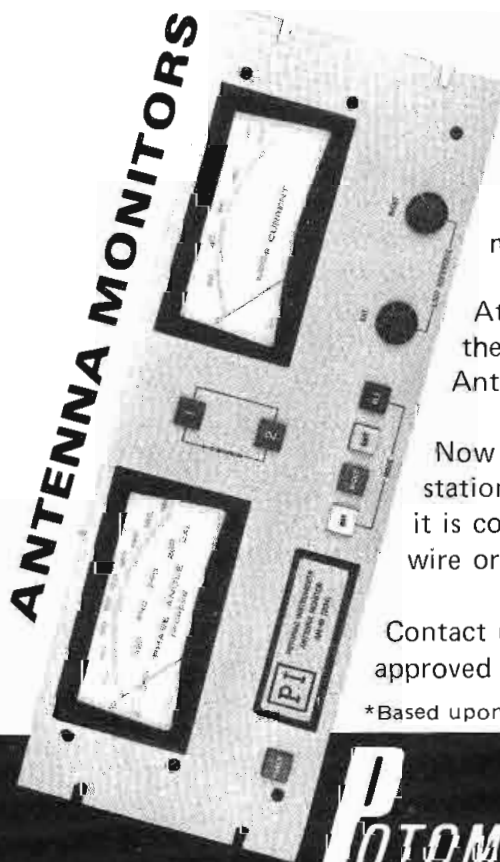
Continental's 317C is the best measure for any 50 kW AM transmitter purchase. Performance, 125% positive modulation and reserve power capabilities are unbeatable. Today's best sound in 50 kW AM is Continental.

Continental Electronics 

CONTINENTAL ELECTRONICS MFG. CO.  
BOX 17040 DALLAS, TEXAS 75217

For More Details Circle (44) on Reply Card

## FCC Rule 73.69 + \$1660 = AM-19(204)



The FCC now says that you must have an approved Antenna Monitor. Since this is an added expense, consider carefully what is required of the monitor versus what it will cost.

At \$1660\*, the Model AM-19 (204) is the lowest priced, FCC type approved Antenna Monitor available.

Now after several years of use at many stations, it has proven its reliability. And, it is compatible with virtually every type of wire or wireless remote control system.

Contact us now on this and other FCC type approved Antenna Monitors.

\*Based upon 2 tower, DA-2.

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SILVER SPRING, MARYLAND 20910 (301) 589-3125

For More Details Circle (45) on Reply Card



## Console Roundup

(Continued from page 57)

### UREI AM & FM Broadcast Console

Urei's Mod One Console features flexible plug-in input and amplifier modules for initial low cost while making future expansion and program format changes simple and economical. All solid-state-of-the-art, Mod One exceeds all proof-of-performance requirements. Space for up to 10 input modules for maximum of 30 inputs, high level or microphone, monaural or stereo. Silent action switches for all on-air functions. Illuminated PGM-OFF-AUDITION lever switches. Long-life vertical faders, with detent cue position (line and cartridge modules).

Mod One also features: Automatic muting of monitor and cue speakers; muting and on-air light control circuits for two studios; monitor select switch with aux. and tape inputs; VU meter switching; and built-in headphone amplifier.

For More Details Circle (96) on Reply Card

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## Ward-Beck Consoles

Ward-Beck produces consoles for broadcast use, TV production mastering, and for the recording industry. Like many other console manufacturers, the company has other lines (distribution amplifiers, intercom systems, solid state switching systems, and related audio components). But unlike most companies, Ward-Beck is a supplier of custom audio console equipment.

Their consoles feature solid state circuitry, and state-of-the-art controls and physical designs.

For More Details Circle (97) on Reply Card

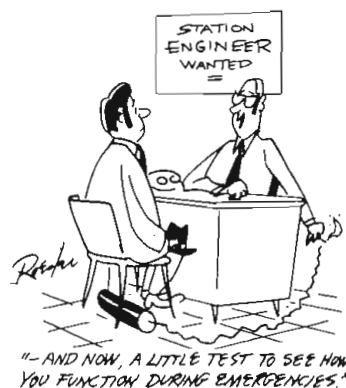
### Wilkinson Electronics Model TAC-1C

The Wilkinson Electronics Model TAC-1C Audio Console uses high quality, vertical step attenuators to provide eight mixers in the space normally required for six rotary type mixers. The Console is housed in an attractive, formica covered steel cabinet with a brushed aluminum front panel. The top cover is removable or can swing back and the front panel is hinged to the base so that it may be swung forward for complete accessibility.

Twenty-two inputs are provided. Two mixers control six microphone inputs and six high level mixers control two turntable inputs, three tape or other high level inputs and twelve remote or auxiliary lines.

Two preamplifiers are provided with space for additional preamplifier. Three interchangeable high level amplifiers are used as cue, program and monitor amplifiers.

For More Details Circle (98) on Reply Card



## Telemet Alive, Doing Well

The September issue of Broadcast Engineering neglected to list Telemet in its 1974 Broadcast Buyer's Guide.

We would appreciate it if you would inform your readers that Telemet is alive and well in Amityville, New York and continuing to supply equipment in the following categories:

- Amplifier, Clamping
- Amplifier, Distribution Audio
- Amplifier, Distribution Video
- Amplifier, Pulse
- Amplifier, Stabilizing
- Amplifier, TV Video
- Analyzers, Sideband
- Character Generators
- Chroma Keyers
- Delay Measuring Set, Envelope
- Demodulators
- Edit Code Generator
- Edit Code Receiver
- Editors, Video Tape
- Enhancers, TV Image
- Equalizers, Video
- Generators, Color Bar
- Generators, Color Sync
- Generators, Convergence
- Generators, Signal Dot Bar
- Generators, Signal TV Synchronizing
- Generators, Signal VITS
- Generators, Staircase
- Generators, Sync
- Generators, Time Code (Reader)
- Generators, Video Sweep
- Switchers
- Switching Systems
- Test Sets, Multifunction
- Test Sets, Vertical Interval

The above categories are those in which we should have been listed this year.

Address your letters to:

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Kansas City, Mo. 64105**

## INFLEXION CHROMATIQUE INFLEXION CHROMATIQUE INFLEXION CHROMATIQUE



For More Details Circle (5) on Reply Card



## NAB Sets May Workshop For Children's TV

A two-day workshop on children's television will be held early next May for station general managers, program directors and producers of children's television programs.

The decision was announced by Robert D. Gordon, vice president-general manager, WCPO-TV, Cincinnati, following a meeting of NAB's Children's Television Committee. Gordon is committee chairman.

The workshop will be designed to provide a forum for an exchange of information and techniques to help improve local children's television.

Gordon noted that "all over the country stations are doing interesting work in children's programming. This workshop will provide broadcasters with an opportunity to learn what others are doing."

Dr. Roger Fransecky of the

University of Cincinnati, a specialist in children's programming, was selected by the committee to assist in formulating the agenda for the workshop.

In another action, the committee announced that it will seek all available research literature on children's television to establish a library for such material at NAB headquarters.

## ERA Directory Available

The 1974-75 Directory of Electronic Representatives has been unveiled by ERA. Included in this new Directory are over 2,000 home office and branch office locations. The reader will find complete information about the representatives including such data as number

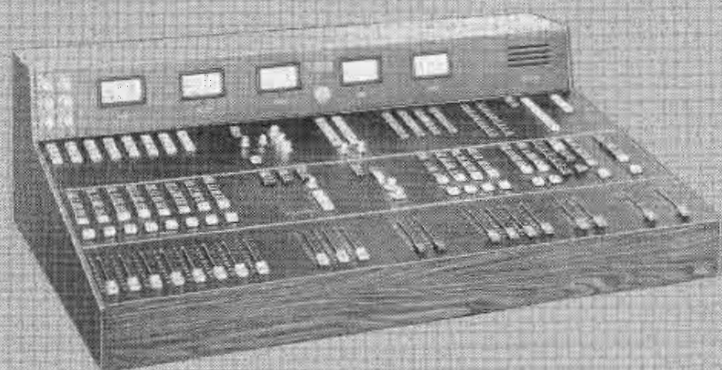
of employees, products/market interests and territories covered.

For your free copy, please write Directory, Electronic Representatives Association, 233 E. Erie St., Chicago, Illinois 60611, or call 312/649-1333 for your copy.

## Modtec Te BE

Tom Creighton, Director of Marketing, announces that the Modtec Division of Broadcast Electronics, Inc. has begun shipments of its modular television monitors. The recently acquired Modtec product line is now under Broadcast Electronics management, with a strengthened and expanding distributor organization. The product line has been redesigned to enhance performance and reliability, while maintaining the flexibility and quick repair features of modular construction. Modtec monitors are now being manufactured under rigid quality control standards at the Broadcast Electronics main production facilities in Silver Spring, Maryland.

## THE RIGHT MIXER



Now there's reason to celebrate!

For as low as \$9995 you can have the ROBINS/FAIRCHILD Model 1632 Audio Mixing Console . . . With such outstanding features as 16 input channels, which handle 64 sources / three submaster mixing channels / dual program output channels / plug-in I.C. op-amp circuitry and illuminated push button switching . . . Plus many options to make the Model 1632 ideally suited to your specific needs.

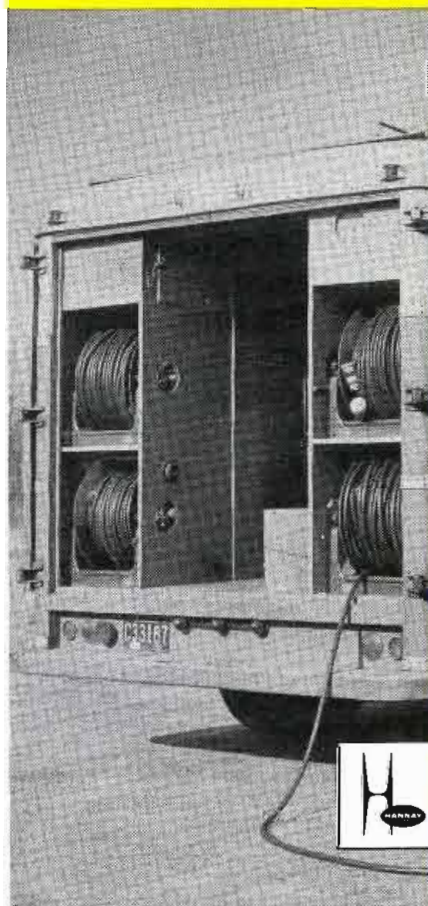
FOR COMPLETE DETAILS CALL OR WRITE RICK BELMONT.

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For More Details Circle (49) on Reply Card

December, 1974

## REELS PUT CABLE ON THE SCENE



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Send for complete information on Hannay Reels for broadcast cable.



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For More Details Circle (50) on Reply Card

59



# NEW PRODUCTS

## Impac Amplifiers

Three new Impac amplifiers are now available from **Modular Audio Products**, a unit of **Modular Devices, Inc.**, Bohemia, New York.

The three new PC card amplifiers are the AM-27 Microphone Preamplifier, the ABL-27 Bridging Line Amplifier and the AL-27A Line Amplifier. All three utilize the MAP 1731A audio operational amplifier as its active element. Designed for PC card rack or individual mounting, these PC card amplifiers have wide application in recording studios.

Model AM-27 is a general purpose audio module suitable for low level microphone pre-amplification. It features transformer coupled input and output, adjustable gain of 25dB to 65 dB, low noise and low distortion.

Model ABL-27 is a general purpose audio module designed for amplification of medium to high level (+20dB) signals or wherever it is necessary to bridge a floating or balanced source. Its features include adjustable gain from -7dB to +33dB.

Model AL-27A is a multi-purpose audio amplification module used in line, booster, differential, or combining amplifier configurations. Features include transformer coupled output, adjustable gain/loss up to +47dB and low noise of -125dBm.

For More Details Circle (99) on Reply Card

## Video Hum Stop Coil

This specially wound toroid coil, HSC-1 from **Audio-Video Engineering Co.**, eliminates ground-loop hum and other interference in video lines

caused by differences in ground potential. A passive device, it is very useful in the field between remote truck and transmission equipment, and in the studio on long runs where ground-loop hum is experienced. Also has wide application in closed-circuit video installations for educational, industrial and military installations. Less than 0.2 dB attenuation from DC to 6 MHz, handles color as well as black and white.

For More Details Circle (100) on Reply Card

## Fast-Recovery Rectifier

**Electronic Devices, Inc.** has added a new fast-recovery silicon bridge rectifier called the PBR to their line. The design is also available as center taps and doublers. The rectifiers feature exceptionally fast recovery of 300 nanoseconds.

The bridge is rated at 15 Amps and from 50 to 1000 Volts. Mounting may be heat sink or chassis.

For More Details Circle (101) on Reply Card

## Dynamic Noise Filter

**Burwen Laboratories**, have just announced the in-stock availability of their new consumer Model DNF 1201 Dynamic Noise Filter. The **Burwen DNF 1201** reportedly does not require pre-encoding of the sound source and so can be used effectively with sound produced by an existing method without modification — microphones, phono discs, or tapes. The DNF 1201 can also be used to produce a substantial noise reduction in any FM broadcast.

The Burwen DNF 1201 functions by

changing its bandwidth constantly, depending on the program material used. It can work with any stereo two channel setup or matrix encoded source. Its' dynamic range substantially exceeds that of records or tapes, eliminating noise and hiss without having any effect on tonal quality.

Since Burwen's DNF 1201 is intended for in-home use, it has been specifically designed for operating simplicity. The component is equipped with several pushbutton controls to choose the correct noise reduction mode, whether 33 rpm or 45 rpm discs, 78 rpm discs, FM broadcasts, cassette, open-reel or 8-track cartridges. A sensitivity control is included to get optimum noise freedom over the total sound spectrum.

The Burwen DNF 1201 is easily incorporated into any existing hi-fi system through the record jacks on any receiver or preamp. The component is also capable of obtaining noise reduction in excess of 14 dB.

For More Details Circle (102) on Reply Card

## DC To 15 MHz Dual Trace Scope

**Heath** now has available a triggered, dual trace, DC to 15 MHz lab grade oscilloscope - the IO-4510. This instrument is available factory wired or in kit form.

Features include 1 mV/cm input sensitivity, 45 MHz typical triggering bandwidth, time base sweep to 100 nsec/cm, post-deflection accelerated CRT, and vertical delay lines that provide at least 20 nsec of pre-triggered waveform for complete signal display.

The IO-4510 attenuator networks can be switched through 12 calibrated ranges to set deflection factors from 1 mV/cm. An internal delay line starts the horizontal sweep prior to beginning of the vertical signal. Digitally controlled logic in the time base circuitry provides automatic triggering. No stability control is necessary. The trigger select switch and level control allow the time base to be precisely triggered at any point along the positive or negative slope of the trigger signal.

For More Details Circle (103) on Reply Card

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For More Details Circle (52) on Reply Card



### Splice Finder

For AM and FM radio stations, the processing of tape cartridges has become an expensive and time consuming job. Most stations require a library of several thousand tapes, varying in length from 5 to 60 seconds. To avoid the possibility of a "blip" on a recorded commercial or segment of programmed material, cartridges must be played through, after having been bulk erased, to locate the splice. Recording, which begins immediately after the splice, precludes the possibility of an audible splice blip.

The unique automatic splice finder produced by the Sensrol Division, **UMC Electronics Co.**, has cut cartridge handling time by at least 50 percent. The splice finder will automatically locate a splice on a cartridge and kick out the cartridge with the tape stopped just beyond the splice point. In this manner, station personnel may perform other tasks while the splice finder scans each cartridge tape.

For More Details Circle (104) on Reply Card

### Automatic Cartridge Tape Bulk Eraser

A new device for erasing broadcast-type video tape recordings in the cartridge format was announced today by **RCA Photophone Sound Recording**, Burbank, Calif.

Known as the Automatic Cartridge Tape Bulk Eraser, the RCA system will erase up to four cartridges simultaneously and will handle either the RCA or Ampex type cartridge.

Adron M. Miller, Manager, RCA Photophone Sound Recording, said the new unit incorporates the principal features of RCA's equipment for erasing two-inch-wide video tape in reel form.

For More Details Circle (105) on Reply Card

### Automatic Video Corrector

The 1460 is an in-line correcting amplifier using ITS line 330 as a correction reference signal. Correct the Reference Signal and the full field signal is thereby corrected too, that is the essence of the automatic correcting action of the 1460.

The 1460 samples six parameters of the Reference Signal in the vertical interval and then automatically changes its operating characteristics until correct values for the Reference Signal are achieved. The full field signal is simultaneously corrected by the same automatic changes that correct the Reference Signal.

The **Tektronix** 1460 Automatic Video Corrector takes the work out of video signal quality control...with fully automatic correction of video

gain, chrominance to luminance ratio, black level, chrominance phase, burst amplitude and sync amplitude. With a 1460, the quality of program signal is rigidly maintained. Ordinary changes and even many severe distortions are automatically corrected, freeing engineering people from the task of regularly readjusting controls. Attempting to keep up with varying conditions with manual correction is no longer necessary. The 1460 does it all automatically.

The 1460 Automatic Video Corrector can be used almost anywhere in 625/50 video systems. A reference signal must be present for automatic correction.

For More Details Circle (106) on Reply Card

### Cross Pulse Generator

**Video Concepts, Inc.** has introduced an all new, solid state Cross Pulse Generator, Model CPG-303, that permits display of the sync pulse crossover point from any composite video source on any standard video monitor.

The monitor picture can be switched from Normal to Delayed (Cross Pulse) from any location without readjusting the brightness or contrast.

The Video Concepts CPG-303 can be used to eliminate annoying "head rolls" by recognizing VTR lock-up correctly, control tape tension (skew) during editing, dubbing and program replay, check edits for correct sync pulses before dubbing and distribution, adjust horizontal and vertical phase to coincide with system (house) sync, diagnose VTR head alignment problems immediately, and adjust head crossover point in seconds.

For More Details Circle (107) on Reply Card



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# Sphere

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**THE CONSOLE COMPANY**

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(213) 845-9661  
Nashville (615) 794-0155

**Audio Control Consoles**

For More Details Circle (54) on Reply Card

### Universal Counter

**Syston-Donner** announces introduction of a new precision 50 MHz Counter-Timer, Model 6250A, that combines both low cost with various high performance features.

The standard Model 6250A performs frequency, multiple period, time interval, ratio, and totalizing measurements. It includes an auto-ranging function that selects a maximum display resolution, both preset and manual trigger level selection, leading zero suppression, 25 mV rms input sensitivity, an 8-digit display, and BCD output of all measurements. Each input channel has selectable attenuator and slope controls.

A wide variety of options can be specified to thus tailor this lightweight, modern counter to virtually all field, bench and some systems applications. The standard oscillator offers a stability of  $\pm 2$  parts in  $10^6$ /year. Four optional oscillators with reportedly superior stability specifications are available including oven controlled oscillator of  $\pm 5$  parts in  $10^{10}$ /24 hours.

A rechargeable battery pack mounted inside the instrument, DC operation, rear signal inputs, a BCD conversion cable, and rack mount kit are additional options.

For More Details Circle (108) on Reply Card

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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, contactors, capacitors. Surpluss Equipment Sales. Clark & Potomac Phase monitors. 2 Thorncliffe Pk. Dr. Unit 28 Toronto 17, Ont; Canada 1-73-tf

**WANTED:** Educational Public Broadcast station needs surplus broadcast equipment, 10 watt or 1 kw FM transmitter, plus any studio equipment. Tax exempt status. Contact Community Radio Project, 885 Arapahoe, Boulder, Colorado 80302. 12-74-3t

**WANTED:** Used 1-5kw UHF transmitter. Can purchase, but prefer tax deductible donation. Write: ETAG, Box 14468, Albuquerque, N.M. 87111. 12-74-2t

**WANTED:** Used b-w and/or color television studio equipment. Need everything. Can purchase, but prefer tax deductible donations. Write: ETAG, Box 14468, Albuquerque, N.M. 87111. 12-74-2t

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NEW Paps hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price \$49.00 each prepaid, while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for TapeCaster series 600 or 700.

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1-72-tf

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(Continued from page 45)

nal/internal sync switch on the pulse cross generator to its internal position and observe the location of the vertical sync pulse on the monitor as shown in Figure 1. Using a felt tip pen mark on the monitor face where this location appears. Then place the sync switch on the cross-pulse generator to its external position. The vertical pulse will drift vertically through the picture and when the pulse (vertical) is exactly at the same position as marked with the felt tip pen execute or put the genlock switch on the sync generator to its genlock position. Glitch-free genlocking will occur. □

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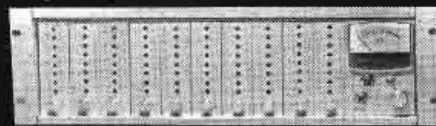
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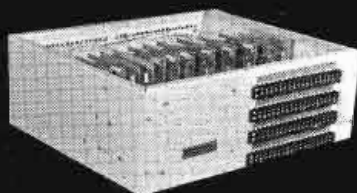
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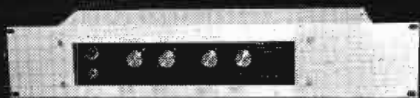
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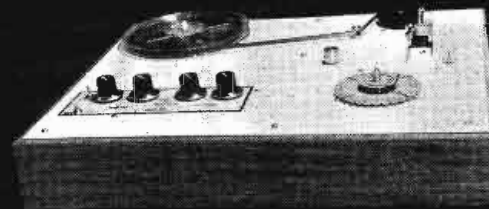
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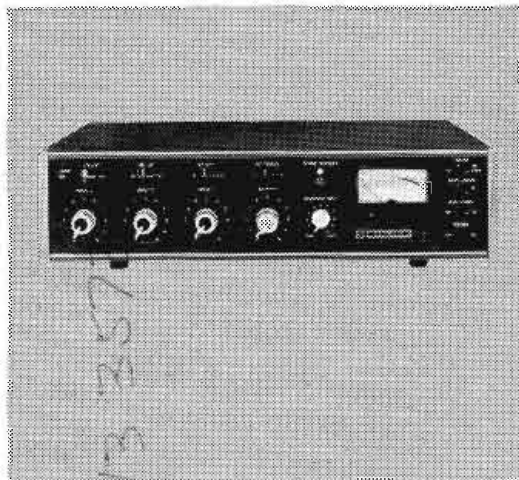
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