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BROADCAST **engineering**

August, 1974/75 cents



Modern studio design

page 18

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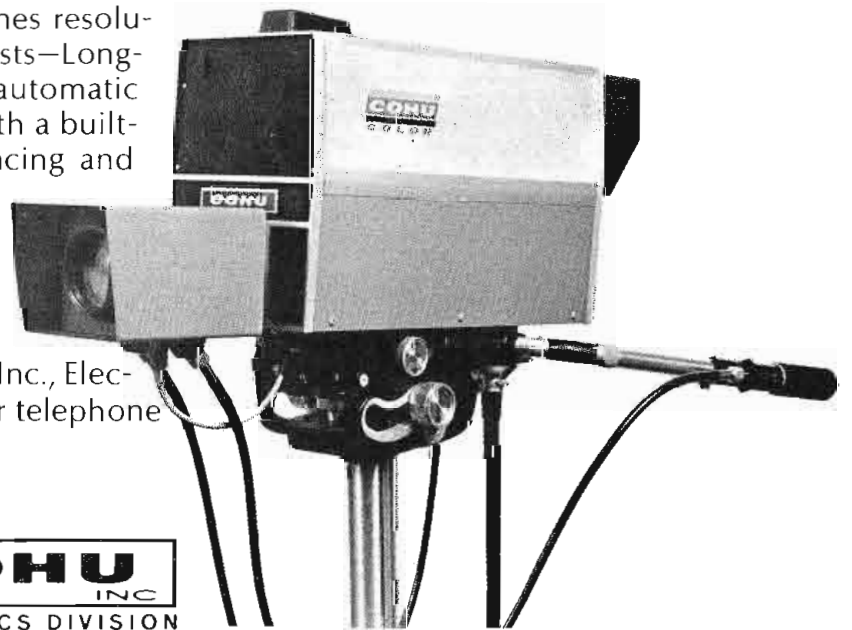


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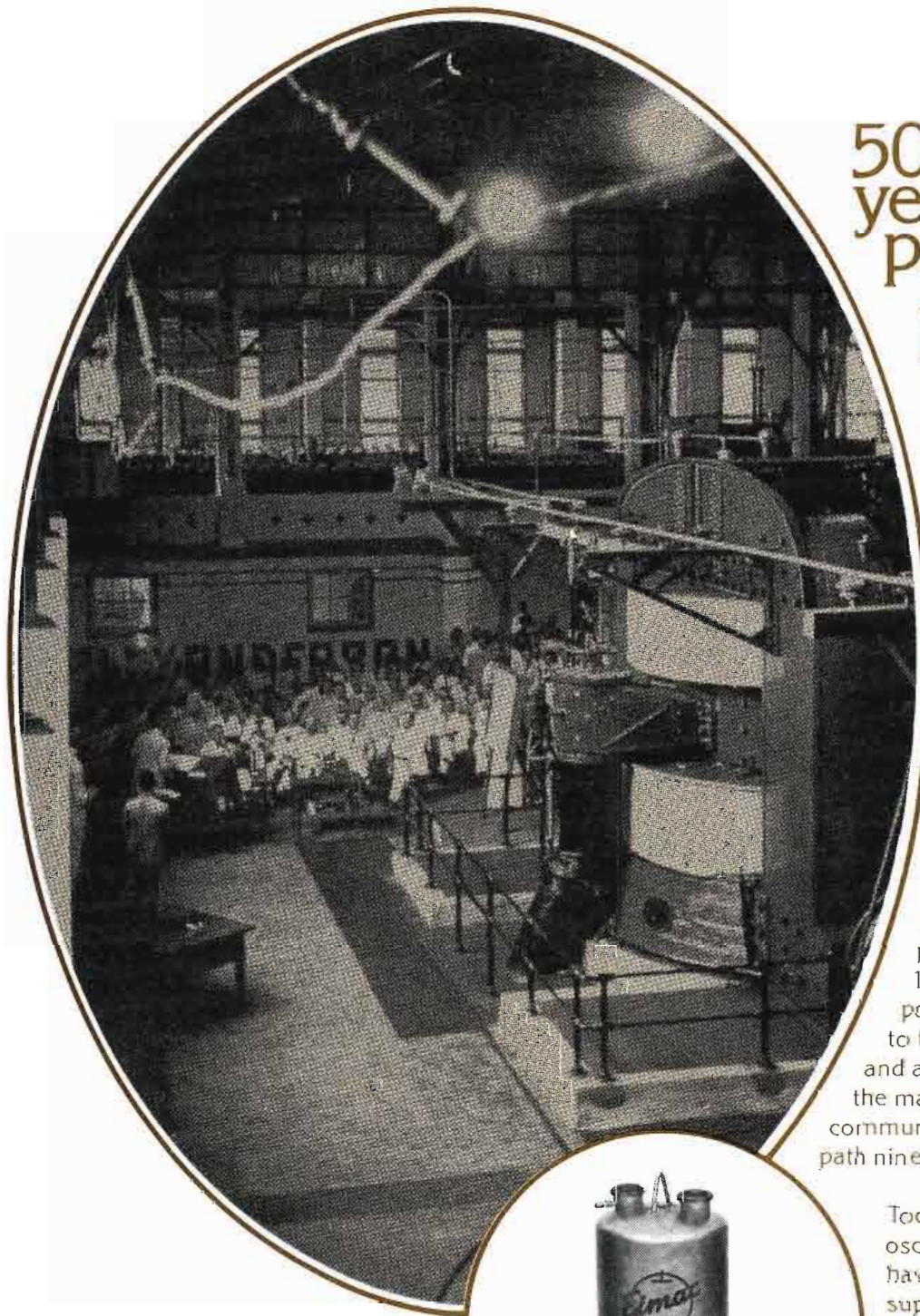


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BROADCAST **engineering**®

The technical journal of the broadcast-communications industry

in this issue...

- 18 **Studio Design And Engineering.** A broadcast engineer takes a busman's vacation/tour in the Northwest and visits a number of stations. His report includes several photos of unique control room layouts. **Clint Tinsley.**

- 26 **Building the 25Hz Super Filter.** Many automation cue tone filters result in degradation of low frequency response. Some stations have disabled these filters. In this article the author tells how to build a sharp filter to eliminate audible harmonics and make the cue inaudible. **Dennis Ciapura.**

- 32 **1974 VTR Review.** Second part of a two-part series explaining the varying formats of several different VTR's currently available. Includes compact VTR's. **Joe Roizen.**

- 28 **Surge And Transient Protection.** Our maintenance editor discusses surge and transient protection. Includes ideas on theory and installation. **Pat Finnegan.**

About the Cover

Our cover this month comes from WCAU in Philadelphia. For ideas on how a number of stations handle control room layouts, see article on page 18. (Photo by Frank Goldstein, courtesy of McCurdy.)

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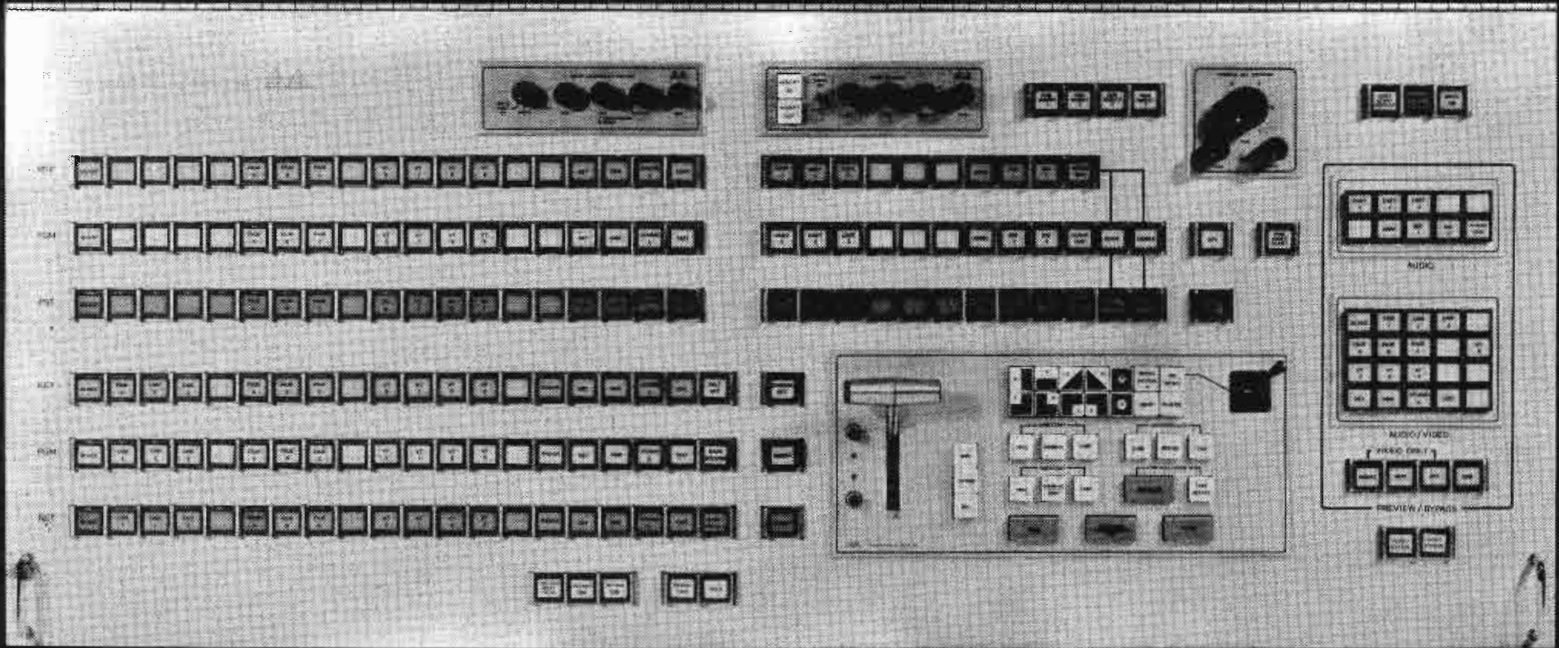


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DIRECT CURRENT FROM D. C.

August, 1974

by Howard T. Head

Commission Moves To Assert Control Over Receivers

The Commission has proposed to establish minimum performance requirements for coast and shipboard receivers in the 156-162 MHz VHF maritime band. The Commission's proposal, which is comprehensive, would prescribe both performance requirements and measuring methods dealing with a wide range of performance characteristics, including sensitivity, bandwidth, adjacent-channel performance, intermodulation, audio response, and noise performance.

The Commission's proposal is remarkable in that with only minor exceptions the Commission's authority under the Communications Act is limited to the control of radio transmitters and other devices such as receiver local oscillators whose radiations might interfere with radio communication. A specific provision of the Communications Act empowers the Commission to specify performance for all-channel TV receivers, and legislation now pending before Congress would extend the Commission's power to include combination AM/FM radio receivers.

In the past, there have been a wide range of proposals urging the Commission to assume authority over many classes of radio receiver--television, land mobile, radio broadcast, and others. If the Commission makes the maritime receiver proposal stick, it could very well be the opening wedge for Federal control over the performance of receivers in all services.

TV Translator Authorized to Relay Direct Satellite Broadcasting

The Commission has authorized the construction of a 10 Watt VHF television translator in Roundup, Montana to receive and re-broadcast transmissions from the ATS-F earth satellite. This satellite, which was successfully launched in June of this year, will shortly begin a comprehensive program of television transmissions, including educational and other television material, directed toward the Rocky Mountain states (See 11/73 & 3/74 D.C.).

This translator operation suggests a provocative potential. Although the ATS-F transmissions will be receivable anywhere within the "footprint" of the satellite antenna beam, power flux densities are so low that large receiving dishes and sensitive receivers will be required to produce satisfactory pictures. Furthermore, the modulation will be broadband FM so that the transmission will constitute more of a microwave relay than a direct-to-home broadcast signal.



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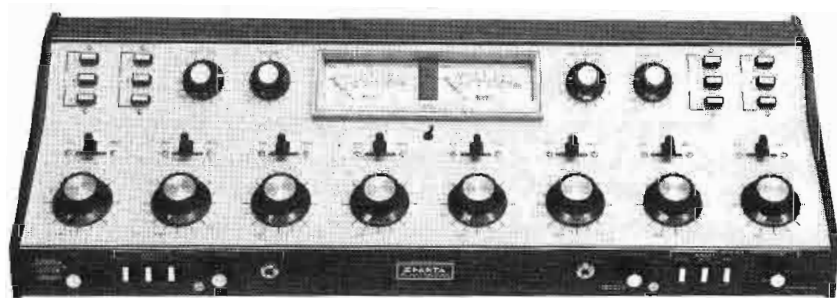
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Initial plans call for the reception and relaying of the satellite signals primarily by cable systems in the Rocky Mountain area. The use of the Roundup translator, however, will make the signals available to all viewers within translator range, and not merely to cable subscribers.

In another translator action, the Commission has decided against authorizing VHF translators to originate local announcements for the purpose of soliciting local financial support. These announcements are permitted on UHF translators, but the Commission has concluded that the authorization should not be extended to VHF translators because of the potential for interference to regular VHF TV broadcast reception.

EBS Does It Again

A closed-circuit test of the Emergency Broadcast System (EBS) was scheduled for Wednesday, July 3, 1974 between 2:07 and 2:14:30 P.M. New York time. All radio network affiliates (no TV) were to participate. According to latest reports, EBS is still batting 1,000: the test ran into difficulties. Among other things, the start was delayed, the National Public Radio Network didn't get the test message, and the audio level of the test message was much too high.

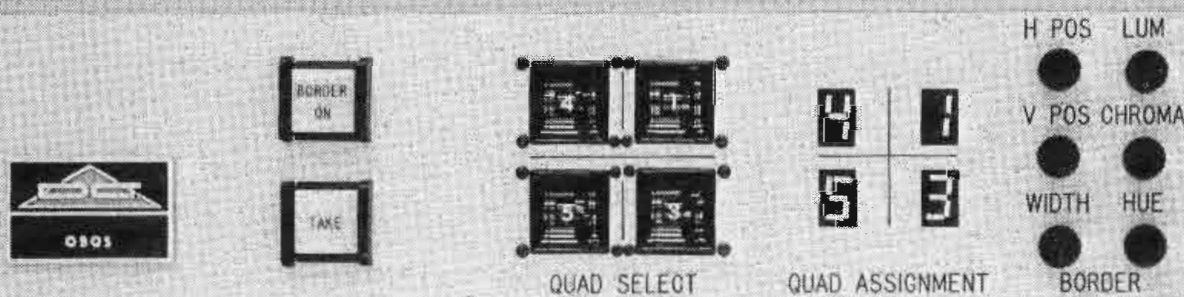
In the meantime, other Federal agencies are undismayed by the EBS successes. The National Weather Service has proposed the construction of nearly 200 additional FM transmitters to provide alerts of severe weather on 162.40 and 160.55 MHz to alert home receivers and broadcasters.

And, finally, the Commission has extended the life of the National Industry Advisory Committee (NIAC), formed to assist the Commission in emergency communications, for an additional two years. This extension limited by law to a two-year period will expire June 30, 1976.

Short Circuits

An AM station in Baltimore, Maryland has been authorized to transmit experimental stereo signals with the stipulation that there be no public promotion of the transmissions...A Knoxville, Tennessee UHF TV station has petitioned the Commission for a shift in frequency to Channel 8 based on a similar proposal contained in the OTP study (see 4/74 B.E.)...The 1974 Fall Broadcast Symposium of the IEEE will be held in Washington, D.C. on September 19-20...The Commission continues to waive FM mileage separation requirements, with a four mile shortage for adjacent-channel operation in Tennessee...The Commission has set for hearing an application by an AM station employing a directional antenna which couldn't make its directional antenna work at 10 kW and now proposes to try again at 5 kW...The Commission has authorized the use by FM stations of a Dolby encoder with a 25 microsecond rather than a 75 microsecond time constant...The Commission has issued a new edition of its Study Guide for examinations for the 3rd class broadcast operator permit...The Commission has expanded its inquiry into the requirements for cable TV channel identification.

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NAB Changes Convention Site For 1976



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The Joint Board of Directors of the National Association of Broadcasters have concluded their semi-annual meeting with action on several matters.

The Board asked the NAB staff to urge the Federal Communications Bar Association to take action with the Federal Communications Commission in an effort to speed up its transfer procedures.

It also appointed an Ad Hoc Committee to review cities where future NAB conventions may be held. Committee members are Richard W. Chapin, president, Stuart Broadcasting Co., Lincoln, Neb., immediate past Board chairman; Wendell Mayes, president, KNOW, Austin, Tex., and Hamilton Shea, executive vice president, Gilmore Broadcasting Corp., Harrisonburg, Va.

Convention Site Change

The 1975 annual convention will be held in Las Vegas April 6-9. The Board approved the recommendation of the Executive Committee that the 1976 convention be changed from New Orleans to Chicago.

The Board also approved the motion that non-NAB members may attend this year's series of six Fall Conferences. Board members will advise broadcasters in their districts that they may invite non-members to attend on a paying basis.

In addition, the Board approved the schedule of the 1974 Conferences and asked the Executive Committee to study the sites, dates and number of meetings.

It also directed NAB's eight-man Executive Committee to study what action broadcasters should take to correct the years of erosion of broadcast freedom, as outlined in a memorandum submitted by Board member George Brooks, president and general manager, KCUE, Red Wing, Minn.

Board members were asked by Grover C. Cobb, NAB senior executive vice president for govern-

ment relations, to contact their Senators and urge them to delete the record royalty provision from the proposed copyright bill when it reaches the Senate floor.

The Board also heard a report on the efforts of the Special Committee on Pay-TV to prevent siphoning of television programs by Pay-cable systems.

It also was advised that the Postal Service has approved a budget for television spots, has prepared radio spots and expects authorization in the near future to buy radio time.

Radio Board Action

The Radio Board of Directors of the National Association of Broadcasters has affirmed unanimously NAB efforts now planned or underway to provide more services to member radio stations.

It also gave its strong endorsement to activities of the NAB government relations department in numerous key areas, including efforts to obtain passage this year of license renewal legislation and attempts to a proposed new copyright royalty for record companies and performers.

With retiring Chairman Clint Formby, president and general manager of KPAN, Hereford, Tex., presiding, the Board took up at a meeting a series of recommendations designed to make radio more visible and provide AM and FM members with additional services.

These include strong programming for NAB's annual Fall Conferences and Conventions, possible management conferences and program clinics, primarily for small market stations, and more how-to-do-it booklets like the recently published primer on radio news.

The new measures were recommended by the Small Market Radio, Membership and Radio Information Office committees.

The Board also approved plans by NAB's Research Department for

a study of the extent to which CATV systems are originating programs, importing distant radio signals and selling commercial time and their effect on radio audiences. The study also will include the extent to which "carrier current" or campus radio stations have hooked up with local CATV systems to provide programs and sell advertising.

The Board also:

- Received a report showing NAB radio membership at an all-time high: 2,396 AM stations and 1,515 FMs. This compares with 2284 AM and 1,378 FM stations at the same time last year.

- Heard a report by Radio Code Board Chairman William W. Hansen showing a net gain of over 500 Radio Code subscribers during the past year. Hansen said 41.6 percent of all radio stations now on the air subscribe and that "there's no question the percentage will continue to climb to 50 percent."

- Authorized stations located in metropolitan areas to decide for themselves whether they wish to be classified according to market size

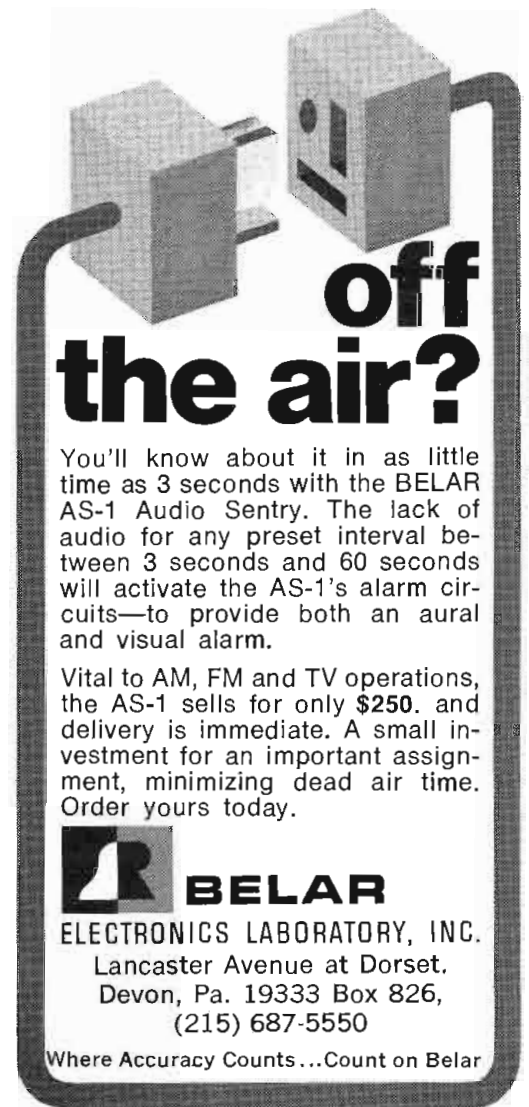
or the population of the city of license.

- Amended its election rules to provide that group owners with both radio and television interests must specify whether a person eligible for nomination is a candidate for the Radio or the Television Board.

Satellite Test For Digital TV

Telesat Canada and Comsat Laboratories of the Communications Satellite Corporation have completed a joint test via satellite to demonstrate the performance of a new Digital Television System (DITEC). The DITEC provides two high-quality color television channels through a single satellite transponder.

The Canadian Broadcasting Corporation participated in the transmission of two color TV channels between Vancouver, British Columbia and Montreal, Quebec, utilizing Canada's ANIK-1 communications satellite.



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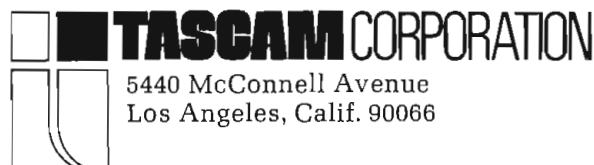
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Manufacturers Win Emmy

Consolidated Video Systems, Inc. has been given this year's coveted "Emmy Award" for the company's "application of digital video techniques to the Time Base Corrector". This award for "outstanding achievement in engineering development" was presented in Hollywood at the National Academy of Television Arts and Sciences "Emmy" ceremony. Receiving the "Emmy" for CVS was Daniel J. Yomine, President.

The Santa Clara based firm received the award for its Digital Time Base Correctors which enable broadcasters and other television equipment users to process and correct video signals from relatively low cost helical video recorders. The company's products have permitted broadcasters to use record-

ing equipment which is smaller and far more portable than previously possible.

Slightly over three years old, Consolidated Video Systems, Inc. specializes in the digital storage and manipulation of video signals.

RCA Broadcast Systems, Camden, N.J., received an Emmy Award for developing the first video tape cartridge system, known as the TCR-100, to automate TV station breaks and broadcasts of other TV program sequences recorded on tape.

The Emmy, one of several awarded annually by the National Academy of Television Arts and Sciences for both artistic and technical achievements, was presented to RCA "for its leading role in the development of the quadruplex

video tape cartridge equipment," according to the citation.

It was accepted at the Emmy Award ceremonies by Andrew F. Inglis, Division Vice President and General Manager, RCA Commercial Communications Systems Division of which RCA Broadcast Systems is a part.

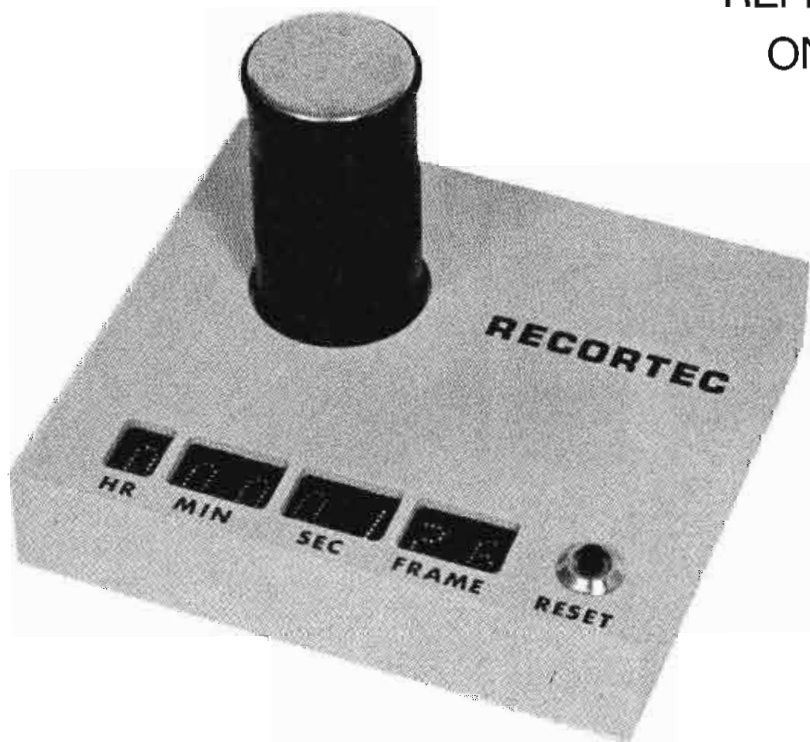
RCA introduced the TCR-100 in 1969. It was the TV industry's first broadcast studio system to apply the cartridge-handling technique to two-inch-wide video tape on which TV picture and sound information is magnetically recorded.

CTIC Asks For Change

W. Bowman Cutter, executive director of the Cable Television Information Center of The Urban Institute, has told the Federal Communications Commission that it should adopt a policy of separating control of cable television distribution facilities from control of content rather than force ownership bars and diversitures upon other local media. His comments were

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submitted to the FCC in response to a commission inquiry into the diversification and control of cable TV systems, specifically dealing with the question of newspaper-cable television crossownership (Docket 18891). Cutter said the comments were filed personally, and the views expressed were not necessarily those of the Institute or of its funding sources.

Cutter noted that when a new technology such as cable emerges, the FCC has traditionally initiated an adversary process—deciding how much of a role it will permit the new industry. He stated that the commission then finds itself confronted with two types of arguments:

“- The emerging technology can argue only on the basis of **theoretical**, projected benefits.”

“- The established technologies can demonstrate **actual** economic harm and project catastrophic consequences.”

WISN Cuts Costs Despite Hikes

WISN-TV, Channel 12 in Milwaukee is saving hundreds of gallons of fuel oil at its transmitter site, which means a considerable dollar savings too, despite the spiraling costs.

In November, 1973, The Hearst Corporation television station's chief engineer, Gerald R. Robinson, initiated the highly successful fuel oil saving program at the TV transmitter.

By recirculating the hot air generated by the transmitters back into the building instead of exhausting it through the roof, it is virtually possible to heat the entire building with the transmitter's own hot air. “We invested in a few small fans so that we can circulate it into other parts of the building,” explained Robinson.

“Even though the fuel has gone up 17¢ a gallon,” Robinson reports, “our saving of fuel oil has more than offset the cost per gallon.” A comparison shows that during the 1970-71 heating season 3,086 gallons of fuel oil were burned at the transmitter site, while from fall to spring '71-'72 usage was 2,779 gallons; for '72-'73 it was 2,510;

and **only 831 gallons were required this year!**

Robinson says the fuel oil saving program should be even more effective next season. Permanent duct work will be installed to transfer the “hot air” from the transmitter throughout the building.

ESE Moves To New Offices

ESE, makers of digital clocks, timers and programmers for broad-

casters, is moving to larger quarters. Their new home will be at 505½ North Centinela, Inglewood, Calif. 90302.

ESE reports the change is due to ever increasing business. The company has recently appointed representatives in most major markets.

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Program Idea Exchange

The Radio Information Office Committee of the National Association of Broadcasters has urged NAB to become involved in radio programming by providing for an exchange of ideas among its radio members.

The committee asked that RIO work with the Station Relations Department to investigate the possibility of program clinics during the summer months.

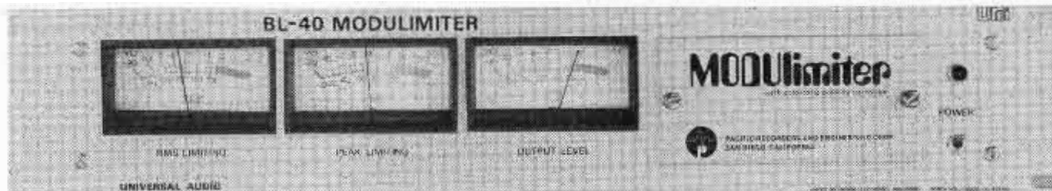
With Chairman Robert R. Hilker of WCGC Radio, Belmont, N.C., presiding, the committee also suggested a number of new NAB publications, including a primer on program management procedures that would list program sources and give tips on cataloging music, scheduling news, etc.

In another action, the committee recommended that its own membership be enlarged from five to eight members and that it include representatives from FM and large market stations.

The committee commended RIO for its NAB-conducted tours of small market radio stations by FCC personnel and suggested that, in future visits, community leaders be invited to meet the Commission representatives so they can express their views on services the stations perform.

The highly successful Radio Free U.S.A. campaign theme of the past two National Radio Months was reviewed and Chuck Blore of Chuck Blore Creative Services who produced the spot announcements explained the rationale behind the theme.

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CTAC Report Is Available

The Cable Television Technical Advisory Committee to the FCC (CTAC), has published a 1973 Annual Report outlining accomplishments of the committee through 1973 and setting goals for 1974.

Copies of the report were sent to more than 150 participants in the CTAC effort, along with a letter of commendation from David D. Kinley, Chief of the FCC Cable Television Bureau and Vice Chairman of the Committee. The document includes abstracts of status reports of the nine panels to December 31, 1973 and establishes general priorities for the remaining work to be accomplished. Although the document is by no means the final CTAC report, it has been submitted to the Commission for their information and consideration.

A copy of the CTAC 1973 Annual Report may be obtained by writing the CATC Office, 1629 K St. N.W., Washington, D.C., 20006.



SBE Fellows

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

In each of the future issues of **BE**, assuming the publisher kindly provides the needed space, background information on one of the elected Fellows will be presented. In this issue, we have selected Albert H. Chismark who has served two terms as President of the SBE and a number of terms on the SBE Board of Directors. Albert H. Chismark is Corporate Director of Engineering, Meredith Corporation, Syracuse, N.Y. Meredith stations include KCMO, Kansas City, Mo.; KPHO, Phoenix, Arizona; WOW, Omaha, Nebraska; and WHEN, Syracuse, N.Y.

Chismark joined WHEN-TV as Station Engineer in 1955 and in 1957 was appointed Director of Engineering. He played a major role in the design and construction of the new WHEN Radio and TV facilities in Syracuse, considered to be among the most advanced in the United States.

He was Chief Engineer and Assistant Manager of WTRY radio and WTRI-FM, Troy, New York, from 1946 to 1955. In 1952 he was assigned the additional responsibility of Chief Engineer for WTRI-TV (now WAST) Albany. In 1940, he designed and built WTRY radio at Troy. He was Staff Engineer with WSYR, Syracuse, in 1939 and WOKO-WABY, Albany, from 1936 to 1939.

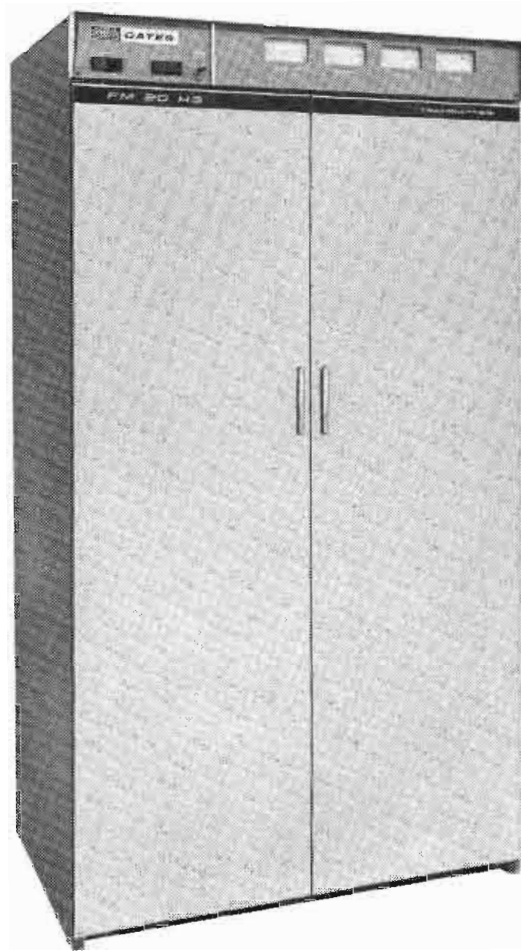
During World War II, Chismark served three and one-half years with the U. S. Navy as a radar officer with assignments in the United States and the South Pacific. He taught technical radar courses at the naval air station, Corpus Christi, Texas, activated the navy radar school at Memphis, Tennessee for aviation technicians, and was navy liaison officer at the Radiation Laboratory, Massachusetts Institute of Technology, Boston.

A graduate of RCA Institute, New York City, in communications engineering, Chismark received his public education at Troy, New York, including a year post-graduate study at LaSalle Military Institute.

Chismark lives in Fayetteville, New York. He is married to the former Janet Hanley of Utica, New York, and is the father of three sons and one daughter—Kurt, 22; James, 20; Lawrence 12; and Cecily Ann, 10.

Aside from his work with the Society of Broadcast Engineers, he is also an associate member of AFCCE and a member of the Society of Motion Picture and Television Engineers (SMPTE) and the Institute of Electronic and Electrical Engineers (IEEE).

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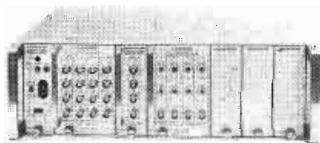
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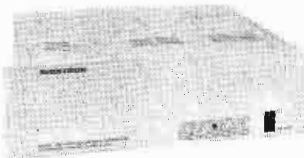


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Chapters In The Making

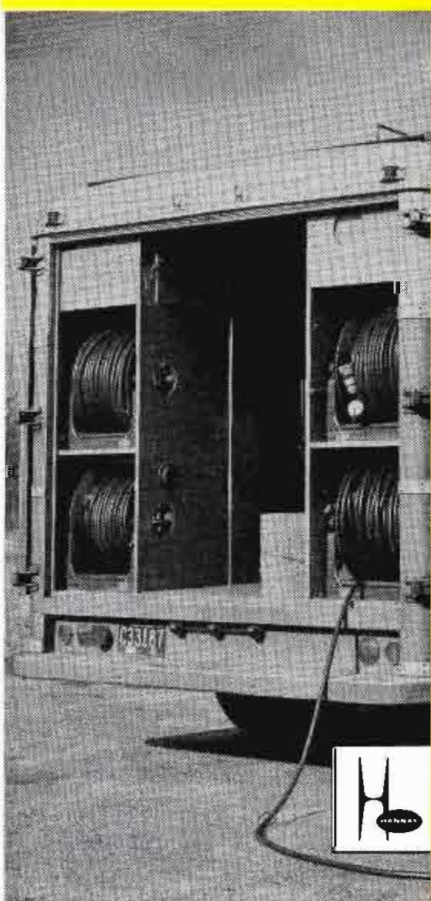
Locations for possible future chapters are listed below. Information on planned meetings may be obtained from the contact listed in each case. Persons interested in development of chapters in other locations, contact Ms. Virginia

Doss, Assistant Secretary-Treasurer, SBE, P.O. Box 88123, Indianapolis, Ind. 46208. In some cases, an SBE officer or director will be available to attend an organizational meeting and explain benefits of SBE membership and chapter participation.

Such special arrangements may be pursued through SBE President, James C. Wulliman, Manager, Engineering, WTMJ, Inc., 720 East Capitol Drive, Milwaukee, Wisconsin 53201. For additional help in promoting a new chapter, keep the SBE Journal Editor posted.

Location	Contact
York-Harrisburg-Lancaster, Pa.	Charles Morgan, WARM, Avoca, Pa. (717) 346-4646.
San Francisco	Robert Dainer, CBS Labs, L Embarcadero Ctr., S. Francisco.
Long Beach, Ca.	Merton Garlick, 3758 California Avenue, Long Beach, Ca.
Petersburg, Va.	Paul H. Bock, WSSV, Petersburg, Va. (804) 733-4567.
Youngstown, Ohio	Leno Leo Laner, NABET Local 47, 7447 Southern Blvd., Youngstown, Ohio.
Columbus, Ohio	Richard L. Walsh, WRFD Radio —88, Columbus, (614) 885-5342.
Quincy, Ill.	Lynd Carter, Tektronix, 3828 Lawrence Rd., Quincy, Ill.
Johnstown, Pa.	W. B. Martin, 70 Colgate Ave., Johnstown, Pa. 15905.
Alexandria, Va.	Charles F. Riley, Tele-Color Productions, 708 N. West St., Alexandria, Va. 22314.
Portsmouth, Va.	Barry A. Ziegenfus, 303 Effingham St., Apt. 7-B, Portsmouth.
Louisville, Ky.	Paul Kelly, WLKY, Louisville, Ky.
Albuquerque, N. Mex.	Guy Smith, KRZY/KRST, Albuquerque, N.M.

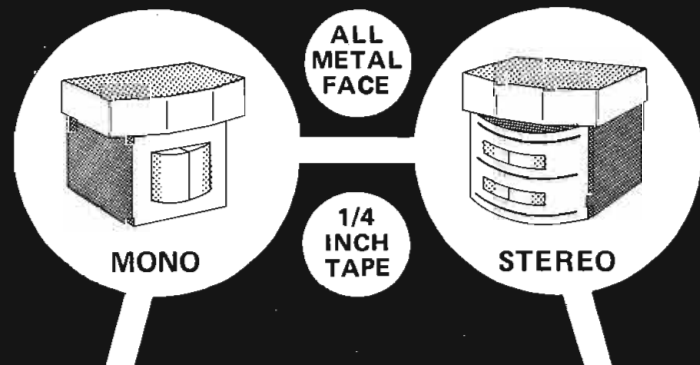
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BROADCAST ENGINEERING

This Is Your Journal

Through the courtesy of the publisher of **Broadcast Engineering**, reports on SBE chapter meetings, and announcements of future events will be published in these pages monthly.

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. Include photographs whenever available; preferred photograph size is 8 x 10, but smaller sizes are also usable.

Chapter 1: Binghamton, N. Y. Chairman: Douglas S. Colborn Horseheads, N. Y. 14845

On June 11th, the chapter held its annual outing at Sullivan's Monument, Newtown Battlefield, Newtown State Park, with family, food, beverages, softball, croquet, and so on. Doug Colborn, Chairman, announced that the chapter will again co-sponsor the Mini-vention; Larry Taylor, originator of the Mini-vention idea, reviewed the plans for the event, again scheduled for October of this year.

Chapter 2: Northeastern, Pa. Chairman: Paul Evanosky Pittston, Pa. 18640

Chapter members met on July 14th at the Irem Temple Country Club, Dallas, Pa., jointly with the Luzerne County Radio-Television Service Technician Association for a combined clambake and business session. Arrangements and coordination were under the direction of chapter Vice Chairman Milan Krupa who is active in both associations.

Chapter 9: Phoenix, Az. Chairman: Leon Anglin Phoenix, Az. 85001

In announcing the May meeting, chapter members got their first look at the new Chapter News Bulletin, edited by Roger Johnson of KOY. The first issue was three pages of data on the previous April 17th meeting, the upcoming May 14th meeting at Zonar Corporation, local area news briefs, national SBE news items, the SBE annual meeting, and directions for submitting news items to the bulletin editor. Future issues will contain an update on local membership, sources for replacement parts, tips on maintenance, free publication listing, short articles, and so on.

The May 14th meeting at Zonar featured Bob Brown and his associates in a demonstration of the JVC

camera, recorder, and time base corrector.

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

The practical aspects of FM propagation were covered by Tom Silliman, Director of Research, Electronic Research, Inc., on June 13th on the 9th floor of the New York Times building WQXR Presentation Theatre, the usual meeting place. Dinner on the 11th floor cafeteria preceded the meeting for those who were able to arrive early enough. For the July meeting, the chapter scheduled Art Silver of Harris, Gates Division (the chapter's Program Chairman also) to discuss the new Gates MW-5 transmitter, a pulse-duration-modulation type. Future meetings will feature a program on time base correctors by Television Micro Time Co., Canon Inc. on cameras and lenses, Angenieux Corp. on zoom lenses, and CBS Labs. Dual programs covering both radio and TV topics are also in the works. Visitors are always welcome. During the business session of the program a possible future Mini-vention was considered; also, members were encouraged to write technical papers for publication in the chapter Newsletter or for presentation to the SBE editor for publication in the SBE section of **Broadcast Engineering**.

Chapter 16: Seattle, Wa. Chairman: Harry Lewis Seattle, Wa.

On June 13th, members and guests met at the Norselander Restaurant, 300 3rd Avenue West. The program, courtesy of Marc and Stan Keck, introduced Joseph L. Scheuer, President, and David Segal, Western Sales Manager for Chiron Telesystems. The program was on the Mark III titling system and the Chiron II electronic graphics system for graphic quality typeface and line illustrations for use in broadcasting. The most recent issue of the chapter Newsletter reviewed the vocational education situation in relation to the broadcast field, a subject very dear to Editor Nick Foster.

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

At the May 16th meeting of the chapter at Buddies Restaurant, Larry Taylor of WENY-TV, Elmira, N.Y. and former chairman of Chapter 2, described the many details involved in holding a Mini-vention. The chapter later voted to hold a Mini-vention on November 1, 1974 at the Marriott Inn, in Green Tree, which is located

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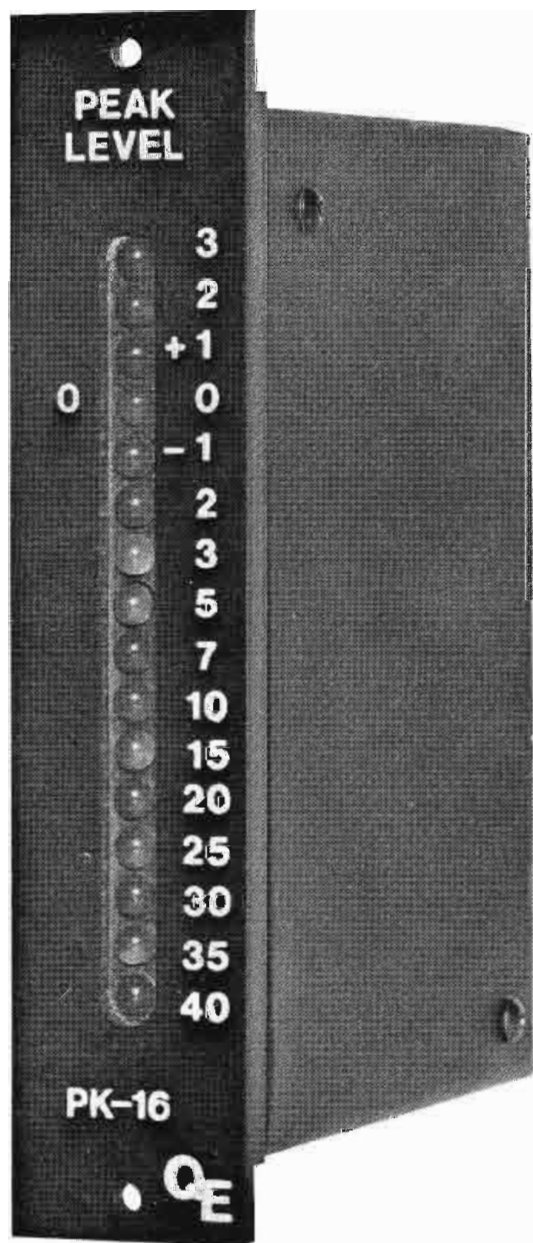
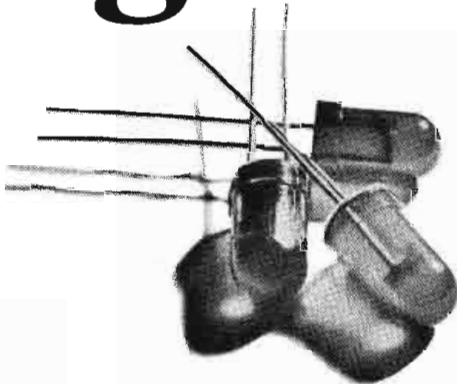
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on the Parkway West adjacent to Pittsburgh. Committees have been formed to expedite plans for the Mini-vention. Taylor was the originator of the Mini-vention having been the spearhead of the first such event in 1973. Further information on the November 1st Mini-vention will be forthcoming in the next issue.

At the June 20th meeting, Bill Cooke, who is the Sales Manager for the NBC and closed-circuit accounts in New York City, discussed the present status of the AT&T Long Lines System concentrating on the many changes that have already taken place and those likely to occur in the near future. Details on future meetings are available from Earlene Rutledge, Engineering Secretary, KDKA-TV, 391-3000.

Chapter 21: Spokane, Wa. Chairman: T. O. Jorgenson Spokane, Wa.

The chapter schedules meetings every Monday at noon at the Castle Restaurant with non-members and guests always welcome. The Castle is located at 29th and Fisk in southeast Spokane. The May meeting involved the following topics: Vertical Interval Signals; What's New In Radio and TV, by Stan Dennett of Engineering Associates; Proof of Performance for Television; FCC Rules on Remote Control and Logging and Audio Limiters and Compressors. At the May 27th meeting, retired formerly KXLY/LFPY Chief Engineer George Langford was honored. At the June Monday noontime meetings, the technical subjects discussed were: Small Color TV Cameras; EXPO 74 World's Fair Coverage Plans on radio and TV; New Klystrons, the Varian 30 kW; Helical Scan Time Base Correctors; Am Station Cross-Modulation.

Chapter 22: Central New York Chairman: Mort Miller Syracuse, N. Y. 13214

Dinner at 6:30 PM at the Northway Inn, June 20th, preceded the technical and business sessions. The program was presented by Lawrence Driskill, Field Engineer of Professional Audio Products, Electro-Voice, Inc. His presentation was a lecture and demonstration on "Practical Sound Technique". The meeting place was the WCNY-TV Studio. Driskill provided a practical how-to-do-it, non-technical lecture and demonstration of microphones and techniques, speakers and techniques, based on case histories. Microphone and speaker applications were illustrated by the use of slides and tapes.

Chapter 26: Chicago, Ill.
Chairman: Bradley Anderson
Chicago, Ill. 60680

The May 23rd meeting was held at Telemation Midwest Production Studios, Glenview, with refreshments provided by Telemation. Vern Pearson SBE member and Telemation Sales Manager, discussed the NEC FS 10-Frame Synchronizer which had been demonstrated at the NAB Convention and which was now touring the country. Also, Hank Maynard, Telemation Chief Engineer, presented the new Telecine camera, explaining the various criteria used in designing it and how some of the decisions were reached. He also reviewed his company's new line of compact sync generators, DA's, source identifiers, and other equipment. The June 13th meeting was at Universal Recording Studios where AMPEX presented a program on the AG440C in addition to other audio and video equipment. Another June meeting, on the 19th, at the Hyatt Regency Hotel featured an IVC demonstration on their new Model 9000 slant track 2-inch VTR for broadcast use and the Model 7000 Plumbicon camera. Those supporting the Chicago chapter include H. M. Dyer Electronics Distributor; Rich Engineering; Swiderski Electronics; Telemation Midwest/Telemation Productions; ABE Credit Union and ABC-TV.

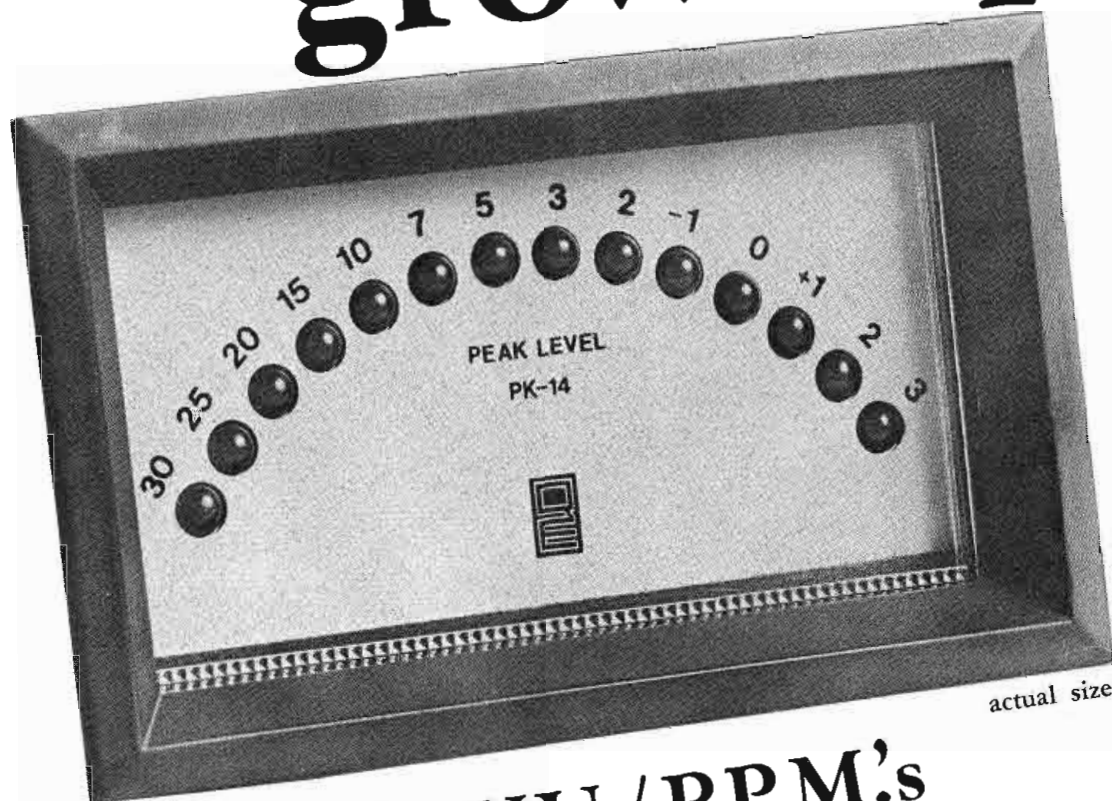
Chapter 28: Milwaukee, Wi.
Chairman: Ed Wille
Waukesha, Wi. 53186

On May 28th, at Radio City Auditorium, C. A. Gustafson, Vice President, Hutmacher and Associates, discussed MATV and CATV Systems, concentrating on the Jerrold line of equipment used in those applications. Nominated for upcoming elections were Bob Truscott as Chairman; Dave Dzurick as Vice Chairman; and Jan Pritzl as Secretary-Treasurer.

Chapter 32: Southern Az.
Chairman: Hobart J. (Bart)
Paine
Tucson, Az. 95717

On June 18th, the chapter met at KGUN-TV Channel 9 studios for a Tektronix seminar on Linear and Nonlinear Distortion. The May meeting was provided by Zonar on the demonstration of the CVS TBC. A nominating committee was appointed at the June meeting. The chapter observed its first year of operation on July 31st. The chapter grew from 9 to 35 members, with Don Anderson Chief Engineer of KGUN being admitted as the 35th.

the meter grows up.



The V.U./P.P.M.'s PK-14 & PK-16

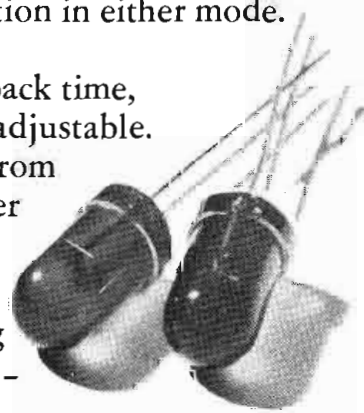
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Fig. 1 This is the KPOK arrangement. KPOK uses a standup operation.

Studio Engineering and Design

By Clint Tinsley

Very few radio chief engineers are given the opportunity to take a trip to visit other stations, outside their immediate market area and view what other engineers are doing. I was given this opportunity on behalf of **Broadcast Engineering** and a vacation leave from the station at which I was employed.

This article will attempt to relate some of the significant findings which I thought were unique or just plain good ideas for better engineering. The emphasis is on radio studio engineering with stops in two major Northwest markets which were Portland and Seattle and then visiting several smaller market stations.

KPOK-AM-FM, Portland

If I had to cut my trip short after visiting the Portland area stations, the trip would have been worth-

while and the engineering being evident at KPOK would have been one of the reasons. The chief engineer at KPOK is Herbert A. Davidson. I was very impressed by this station because good engineering was very evident in a very large operation and handled by a single engineer. The challenge for Davidson as chief engineer is to keep a 5 kW AM directional and FM stereo station, both of which are remote controlled, as well as four operational studios, news remote facilities, and a large automation system in top operating condition.

Davidson's way of meeting the challenge was to design a well thought out maintenance schedule which covered every item of equipment in the station inventory.

It was very apparent that every operational facet of this station, from an engineering/operational viewpoint, had been well thought

out. The AM studio cluster consisted of three operating areas which were the main studio, production/talk, and news announce, with full line-of-sight between each without sighting through one of the other areas.

The main studio at KPOK was a standup operation and is pictured at KPOK-AM. You might note that tape machine controls were integrated into the audio console. The announcer has found it more convenient, at least at the time of the photo, to utilize the controls found on the cart machines themselves. There are a few different approaches that might be taken to auxiliary machine control operations and we will attempt to show some of them later in the article.

KPOK news shows a unique audio control unit and auxiliary machine control box just to the right.

STEREO PACKAGE SHOWN: KMOX-FM — ST. LOUIS, MISSOURI



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KEX - 50 kW AM Directional

This station was particularly noteworthy in that it had just undergone complete studio renovation. The chief engineer is Paul Matthews. The studios laid on a common axis off a hall which were parallel to the studios. There were glass sound locked windows between each studio.

Operational keynote at KEX was a very versatile intercom system which not only interconnected the studios featuring hands free operation at the receiving end but also accessed the two-way radio link equipment, including transmit control. The intercom unit is pictured directly below the cart machines at KEX-AM.

Another operational feature was that in all the studios except master control, there is a desk microphone

with its own preamp/line driver that could be switched to any of the audio consoles in another studio for ultimate studio flexibility. At KEX, it was also possible to go live instantly from any of the studios.

KEX wiring shows the interconnect wiring which was normally concealed behind removable panels in a false back under the console.

Management Highlights

It's always interesting to see how other stations are put together. In order to give you a look at a group of stations, we sent a chief engineer off to Oregon and Washington with his camera. We hope the photos will give you some inspiration and ideas for your station.

There is one note of caution needed. Each of the stations covered have put together equipment and layouts that were designed to fit specific station needs. Your first question should be, does our layout complement our program format and operational needs? Or does your layout actually impede progress and restrict profits?

KPAM - AM & FM

KPAM could give some lessons in RF suppression and control in that its studios were built on one of the "transmitter hills" surrounding Portland. RF problems included television RF, FM and, of course, AM radiation. There was copper shielding throughout, as just one of the measures taken.

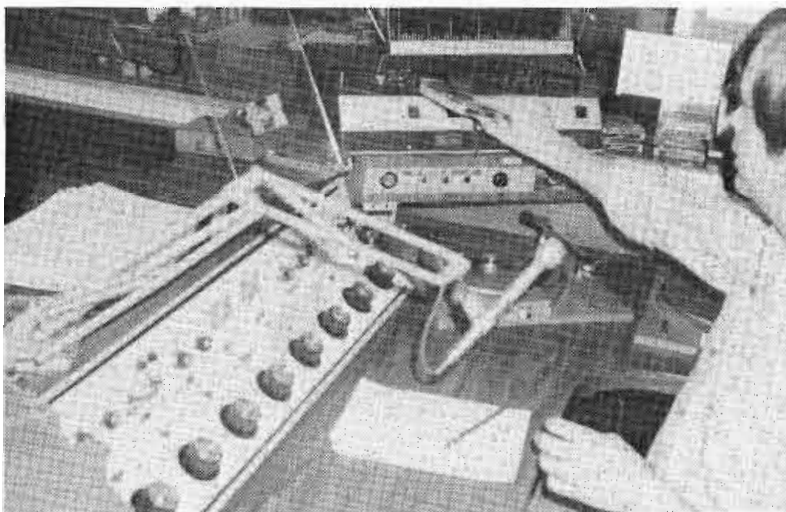


Fig. 2 Here's the main studio at KEX. Note that this operation is still based on 45's and carts, with both at the operator's right side.

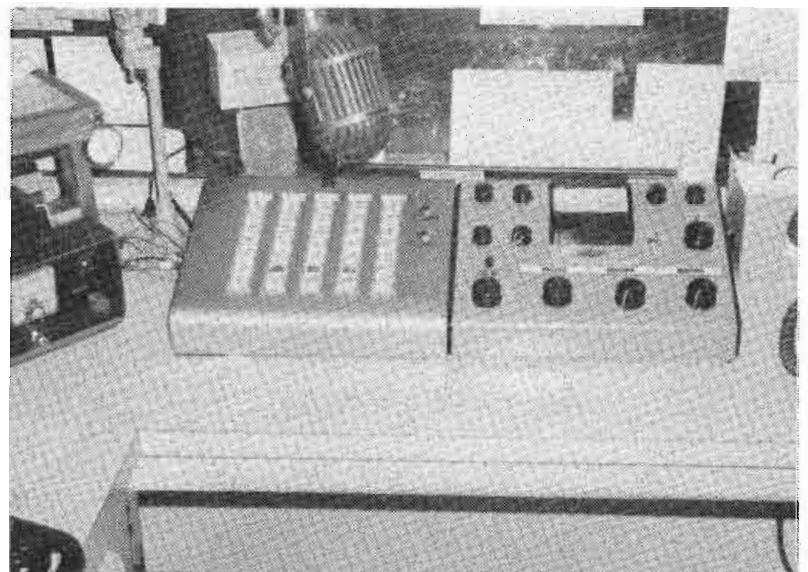


Fig. 3 This is a newsroom shot at KPAM.



Fig. 4 KISN uses a streetside studio. The station uses a digital timer which resets each time a function is initiated via a momentary closure/pulse. This is useful in maintaining a tight program format.

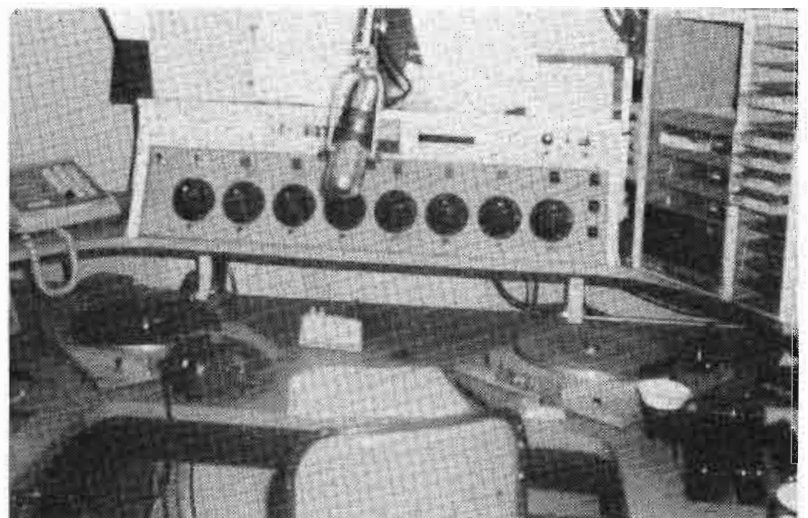


Fig. 5 Station KOL is certainly state of the art. Here you see a board based on Op Amps that was built by the CE, Bill Wolfenbarger.

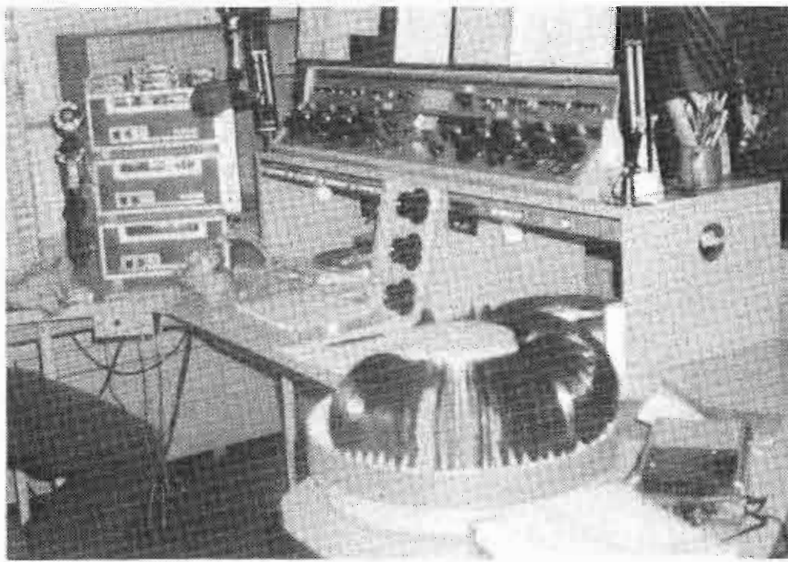


Fig. 6 KING is a semi-standup operation. Semi, because the turntables are under the board. And, note the lamps under the board that light the turntables.



Fig. 7 KENE is another station with the turntables under the board. But since this is not a standup operation, the turntables are pulled out enough to allow easy access and elbow room. The raised board allows easy turntable operation and does not require extra lighting.

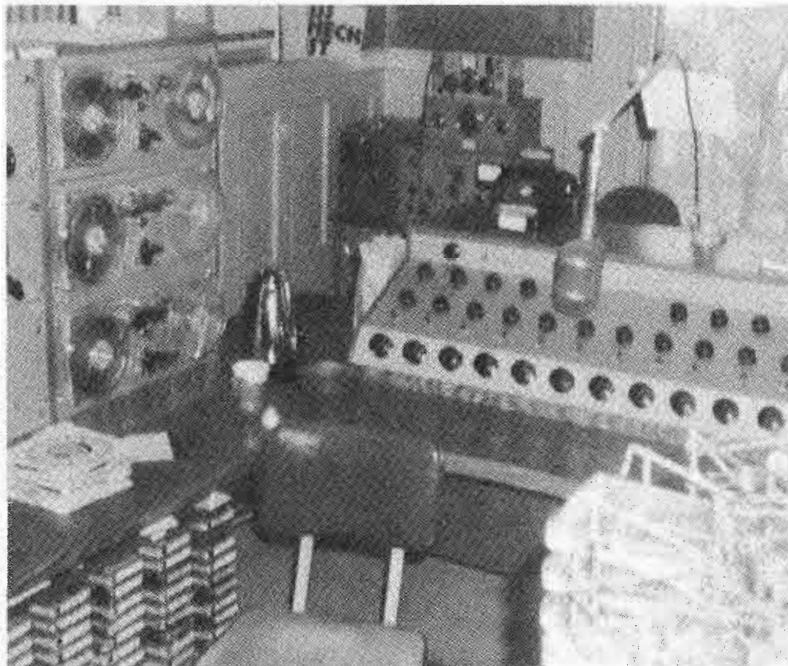


Fig. 8 KWJJ and a mixture of reel-to-reel and carts. Cage at right is a cart wheel. Note that extra cart storage is provided under the left side of the desk. At right, and not shown in the picture, are three side-by-side turntables. The records are in racks immediately above the turntables.



Fig. 9 A western station? No, but it could be. This layout is not so unique. What is different is the unique control board. It's currently in use at Piccadilly Radio, London. We included it here because it makes use of the slide controls which are coming into fashion in current board design. (Photo courtesy of Rupert Neve)

Also at KPAM, was a audio crossbar system featured some years ago in **BE** which permitted access to any audio source in the station from any operating point in the station. KPAM-News shows the crossbar access control box directly below the microphone.

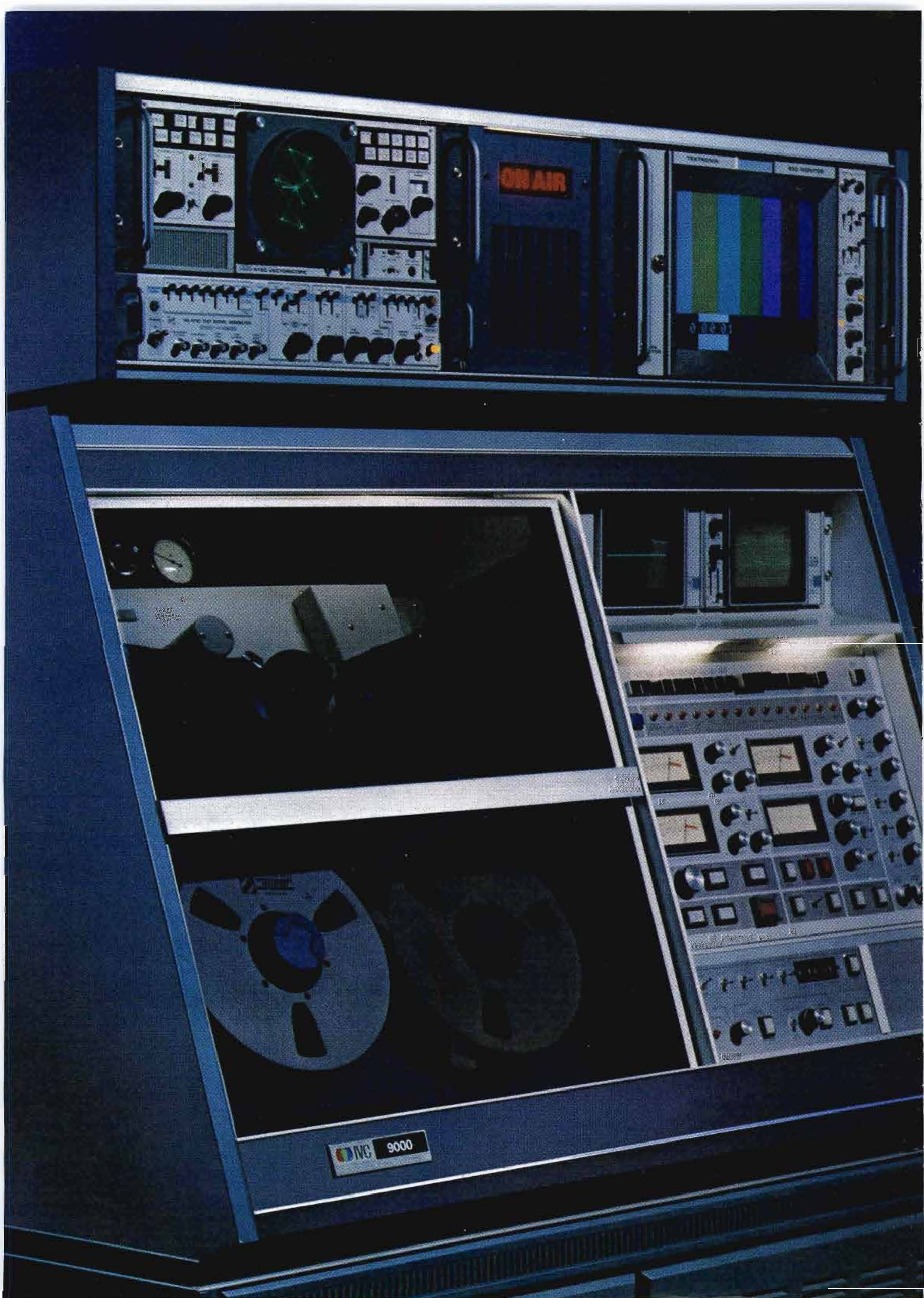
KISN-Vancouver

One of the good operational ideas, in my opinion, was found here. KISN is licensed to Vancouver

but maintains studios in Portland. This operational feature was not only found at KISN but at KOL AM-FM, Seattle, and I have seen it at other stations since. The keynote feature is a digital timer which resets each time a studio function is initiated via a momentary closure/pulse from the studio function which is very useful to the operator in maintaining a tight program. The operator knows the specific length of a program element and

can time his program accordingly.

At KISN-AM, the resetting action is made by starting the studio function via one of the push-buttons on the strip below the RCA audio console. The timer is located just to the left of the two vertical AGC meters. To the right of the meters was space for a 12-hour digital clock which was not in service at the time of the photo. Chief engineer at KISN is Byron Swenson.

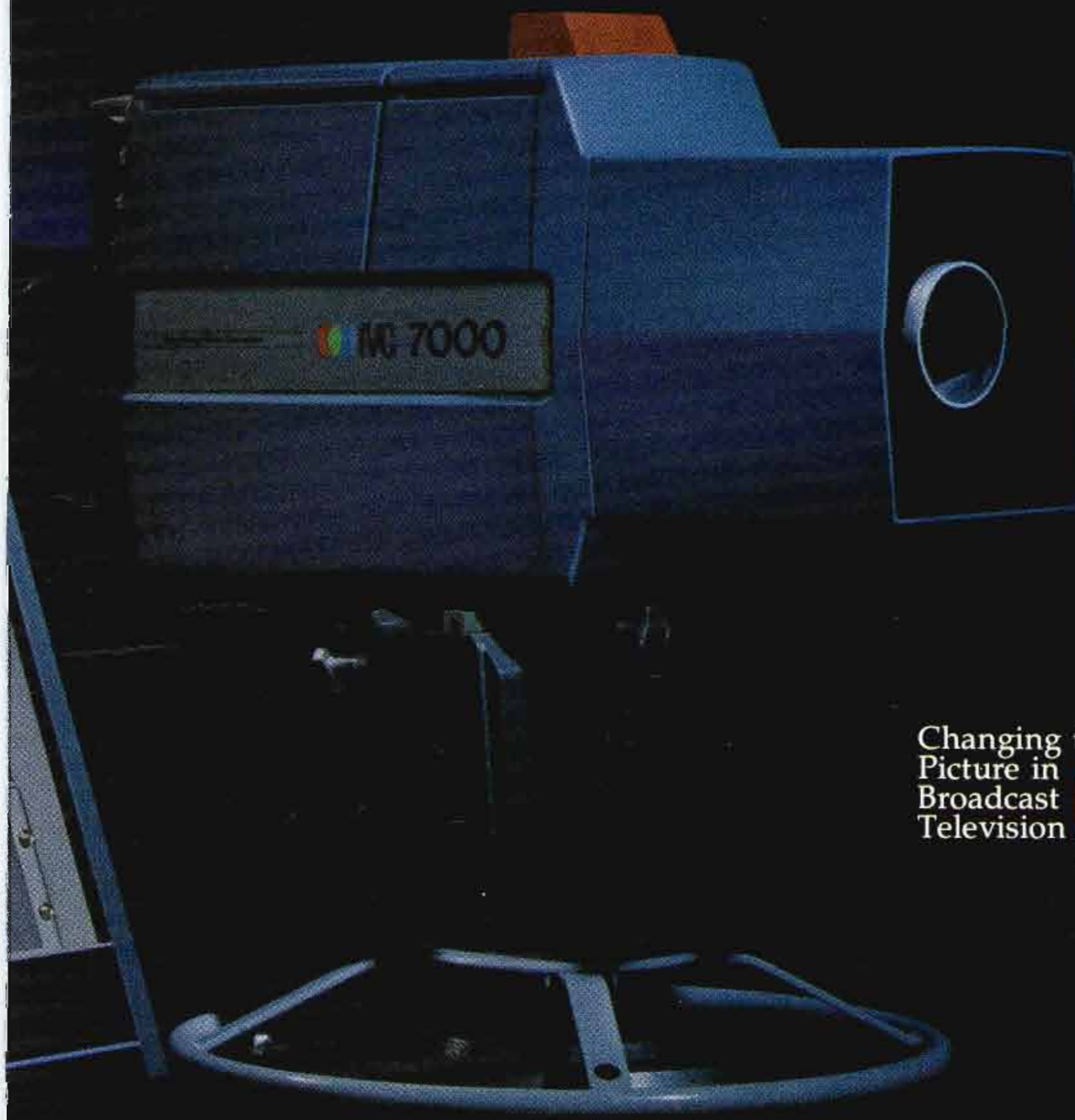


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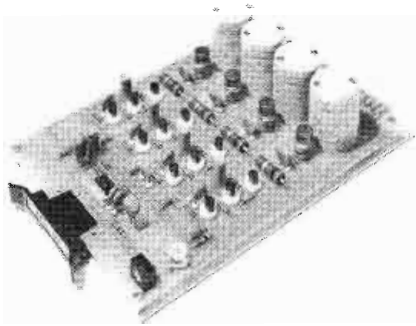
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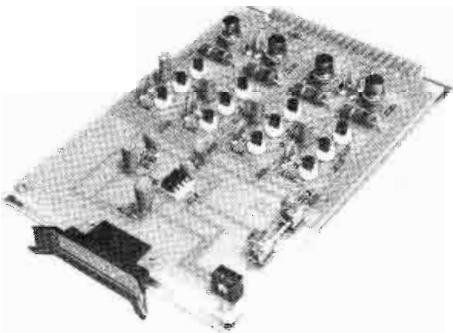
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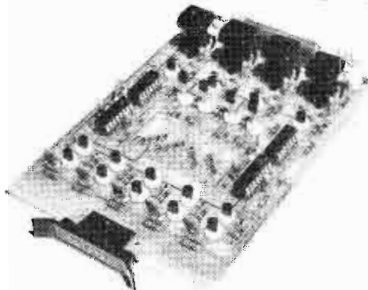
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KOL - AM & FM, Seattle

Bill Wolfenbarger is C.E. at KOL, and he built the audio console in the photo. Internally, it is based on Op-Amp devices out of Op-Amp Labs of California. I have used Op-Amp circuits since visiting KOL and would invite other engineers (see **BE Op Amp Series**) to consider their use in line driving mike preamps, limiters, equalizers, etc. I built a stereo line amplifier using a pair of 425 Op-Amps with performance unexcelled by any solid state device I used previously or since.

KING - Seattle

KING Radio is part of KING AM-FM-TV, but of particular note is its new AM studio which, like KPOK of Portland, is a standup operation. The unique extender panel is shown at KING-AM.

I saw several varieties of extender panels on this trip but this one was the best. Most extender panels consist of a channel lever key (which does not show up in the photo). It was immediately adjacent to the level control, and of course, the level control itself.

Also noteworthy at KING, were the machine controls and indicator lights dressed along the front ledge of the audio console desk and the small "spot lights" which light the turntables. I should also call attention to the phone jack connector at the operator's left, under the main desk. This seems to be an overlooked item, as most consoles put the headset jack on the end or the middle of the audio console. If an extension jack is permitted, it's usually of the Hi-Z type and is at an insufficient level to drive the 8 Ohm stereo headsets that are finding their way into a lot of stations.

Other Notes Of Interest

Leaving specific stations behind, I'd like to make some general observations concerning actual studio consoles, machine controls, and production room layout.

One of the nicest studio consoles seen during the trip was at KENE-AM in a one station market at Toppenish, Washington. The console was designed by the staff of KENE under the direction of Al Wynn, GM and VP. The console was very spacious with an abundance of storage space in the form

of cabinets and drawers in the legs of the U-Shaped console.

The machine controls are noteworthy in that they are recessed in the middle of the console desk. I have only one reservation to this approach, which is used at a number of stations. It can be a real problem in terms of spilled liquids and as a dust catcher.

Another approach can be seen at KOL-FM, Seattle, with machine controls on a sloping panel or with machine controls on upright panel as shown at KISN-AM. My own criteria for machine controls places them above the console desk and at the same level or below the audio console controls.

One of the better production room layouts for a compact production facility was found at KIT AM-FM, Yakima, Washington. In addition to the normal production room equipment of turntables and tape units, was a shelving equalizer which was routed through a patch panel which is excellent for tailoring voices and cleaning up out-of-house tapes. Machine controls and level controls for the turntables are built into the desk top.

I might add that the slider type level controls were finding their way into many stations as auxiliary controls for the turntables. Such stations included KGW of Portland which had recently built a complete new "Broadcast House," which was impressive to visit.

Of interest to management, might be the variety of engineering help found along the way, like Davidson of KPOK in Portland and Bill Glenn of KSMK of Pasco, Washington. Glenn not only is an outstanding engineer but also serves as program director at that station. All of the stations were single engineer operations, except the television affiliated ones. Well engineered stations generally employed a full-time engineer. Very few contract chiefs were found in the top operations.

Note Of Thanks

I would like to express my thanks to all the engineers who gave of their valuable time and showed me their facilities. Stations who also deserve mention, besides KGW of Portland (which was not shown in this article due to a broken camera at the time of my visit), include KOMO and KIRO of Seattle. □



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August, 1974

25

Building The 25 Hz Super Filter

By Dennis Ciapura

Many automation cue tone filters result in such a degradation of low frequency response that many FM stations have disabled the filters from the playback system. The stations that have technicians in charge of the audio usually try to stop the tape decks manually, if the filters have been removed, to keep the 25 Hz tone from being aired. Other stations simply broadcast the tone and hope that no one is offended; the tone is inaudible anyway, isn't it?

Well, not exactly. While a pure 25 Hz tone itself would be inaudible and perceived only as a rumbling feeling rather than a sound, any distortion in either the transmitting or receiving system will cause the generation of harmonics well inside the audible band. Speaker second harmonic distortion, or doubling, as it is sometimes called, is the worst offender in this area and very often what emanates from the listener's stereo set is more 50 Hz second harmonic and mechanical speaker noise than anything else.

Remember that the loudness-compensated volume control may boost the 25 Hz response 30 dB, so that the guttural belch of an un-

diminished 25 Hz stop tone at the end of a music segment is quite audible and usually evokes a listener reaction that lies somewhere between curiosity and mild annoyance.

Even if the filters are removed from the playback system, some method of mastering the tapes with the 25 Hz area notched out must be employed in the recording process to prevent music trips of the cue tone detectors in the playback control system. If the usual passive filter is employed in the recording process and another in the playback system, we can expect a total loss of about 3 dB at 50 Hz, 6dB at 40 Hz and virtually no response in the 30 Hz range.

Obviously, the ideal situation would result if we had some 25 Hz filters that had reasonably flat response down to the 30 Hz limit of audibility yet would still notch out the cue tone by 40 dB or more. We could employ that kind of filter in both the mastering and playback portions of the automation process and thus allow the system to function as it was intended to without sacrificing bass reproduction.

The answer to our dilemma lies in substituting active electronic filtering for the standard passive filters. Many very good electronic filters in the form of variable Q

equalizers can be obtained from the recording industry suppliers, for it is in the recording studio that these devices have found their first home. A close look at the response and distortion specs will tell you if the unit that you plan to purchase will do the job for you in theory, but try to borrow a sample to use for a while so that you can be sure of its stability and reliability before you make the final investment. If you like to "roll your own", read on.

A Practical 25 Hz Active Filter

The Super Filter shown is adapted from a combination of circuits described by Walt Jung in his "IC OP AMP Cookbook" and the "IC OP AMP Story" in *BE*, May, 1974. The circuit is really quite simple but works amazingly well.

IC2 and IC3 invert the roll-off characteristics of the .068 μ f capacitors in their feedback loops, which, in turn, is inverted again at the inverting input of IC1 to yield a high pass function at its output.

The low pass output of IC3 and the high pass output of IC1 are added at the input of IC4 which provides a low impedance "notch" output. The circuit has an overall gain of about 10 dB with negligible distortion. As a matter of fact, the audio coming out is a duplicate of the audio in, minus the transformer losses. So, if top quality units are used, a 0.05 percent distortion level across the band is very easy to obtain. As you can see from the performance data in Figure 1, the response doesn't hit the -3 dB knee until 30 Hz and yet provides a notch 46 dB deep at 25 Hz. Actually, the Q of the circuit could have been increased quite a bit, resulting in a still lower cut-off frequency. The sides of the notch become so steep that the 25 Hz tone frequency becomes critical, so, we worked it the other way around. The value of the resistor at the non-inverting input of IC1 was chosen to provide for reasonable tone generator drift tolerance and tape deck speed variation.

The power supply is designed to provide normal operation of the circuit over a supply input range of 105 - 135 VAC. Each channel of the filter circuit only consumes about 10 m.a. of supply current, so the supply provides some degree of overcapacity and runs cool. The input and output transformers

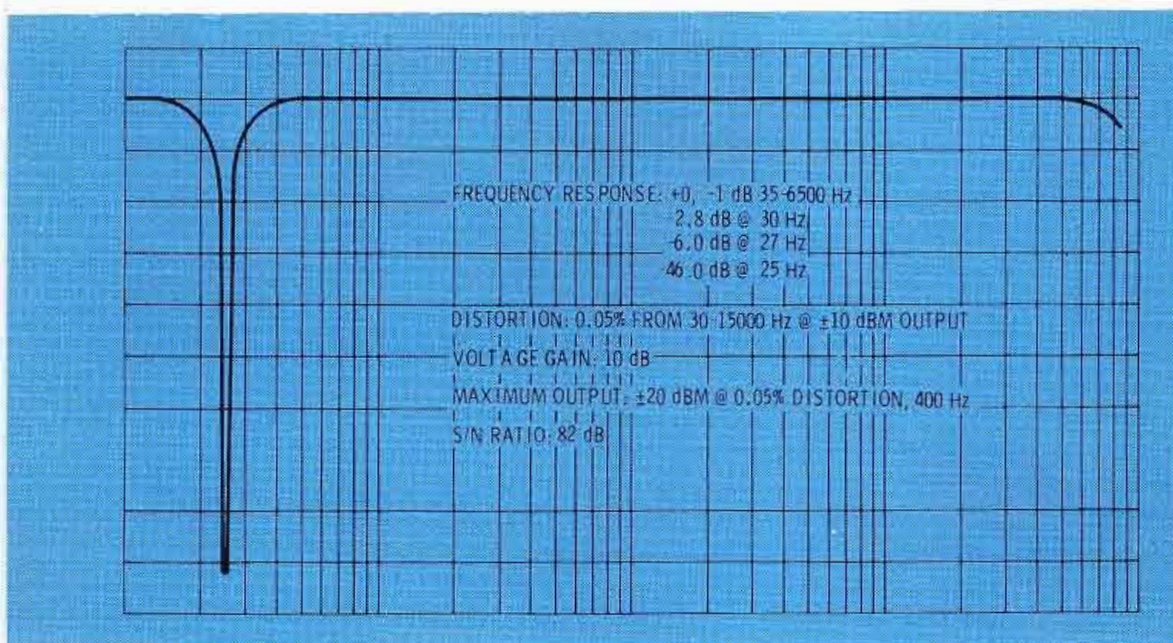


Fig. 1 Super filter performance data.

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Price	\$3,395	\$6,670

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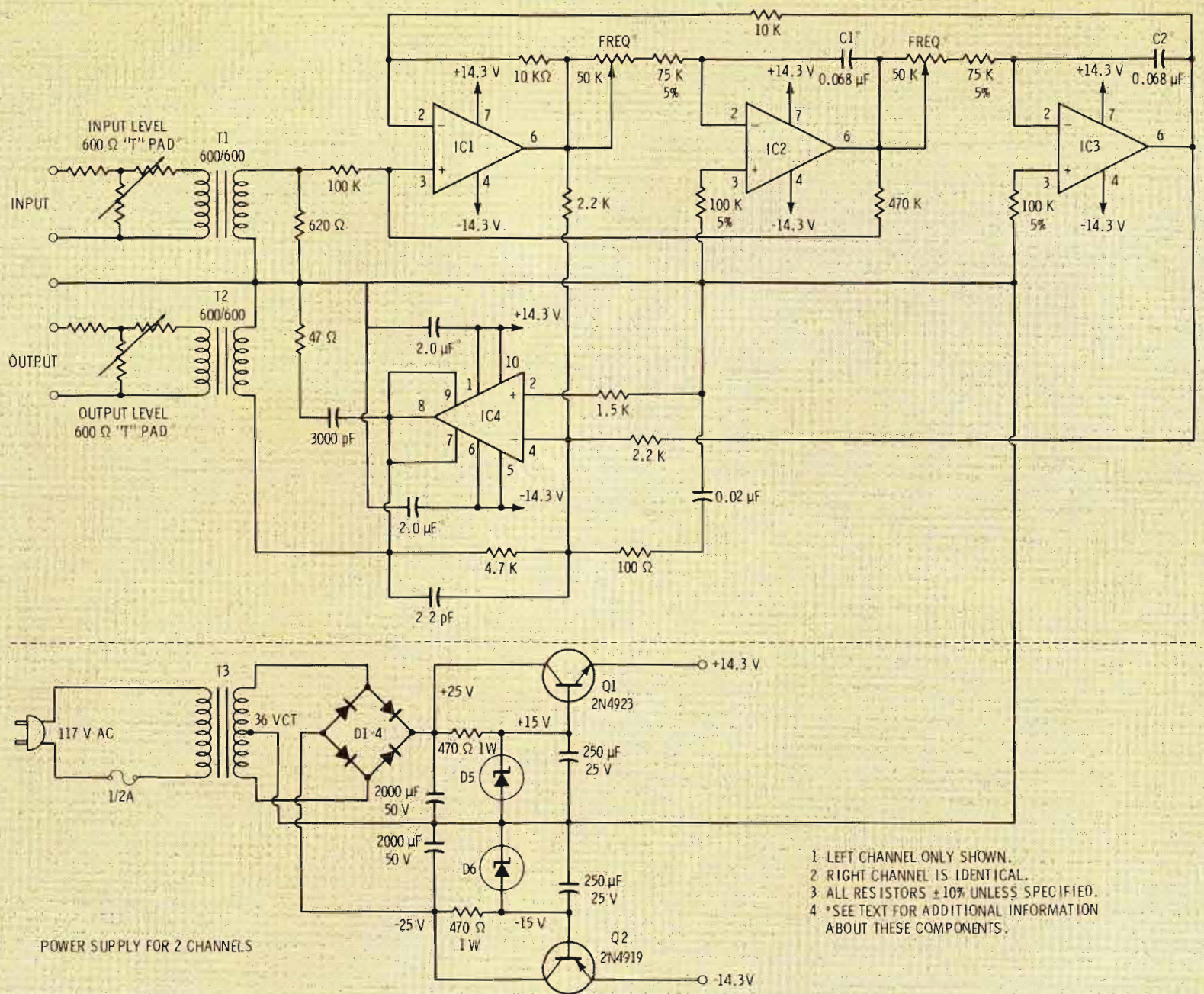
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4. *SEE TEXT FOR ADDITIONAL INFORMATION ABOUT THESE COMPONENTS.

Fig. 2 Schematic for the super filter. The power supply is designed to power two filter sections for stereo stations.

should be chosen to match the output impedance of your automation system and the input impedance of your console.

The "T" pads, of course, should match whatever transformer impedances you have chosen. A medium level line matching transformer is fine for T1 because the 10 dB gain of the circuit reduces the input level required.

Multi-turn precision pots are recommended for the frequency controls for ease of adjustment as the filter tuning is quite sharp. Solid tantalum capacitors should be used for the 2.0 μf bypasses at IC4 because they have low impedance at higher frequencies, remaining non-inductive, but you may find that 1.0 μf or 0.5 μf units will be large enough to prevent oscillation. Select the most stable .068 μf capacitors available for the feedback reactances.

The current through the zener diodes in the power supply is only 30 m.a., so 1 Watt units will run at half dissipation. If you can't find any 15 Volt zeners, 6 and 9 Volt zeners in series are fine. Several manufacturers make a dual 741 op amp which would allow constructing the entire stereo version of the filter with only two 540's and three 741 duals.

The series regulator transistors in the power supply can be almost any power transistors than can take at least 60 Vcb and have a beta of at least 10. D1-4 could be individual diodes that you may have on hand instead of the bridge in the parts list. Component layout is not critical except that the supply bypasses on IC4 should be mounted right at the IC with the connecting leads as short as possible.

You may have noticed that the diagram shows no connections for

the IC offset null terminals. The gain of each IC is feedback-limited to unity or close to it, so even though the filter has several direct coupled stages, the DC voltage at the output of IC4 is almost 0 and virtually no current flows through T2.

Using The Filter

Tune the filter to the frequency of the 25 Hz tone generator (used to apply the stop tones to the tapes) by adjusting the frequency controls by the same number of turns (unless a ganged multi-turn pot was used). Even if the tones are only recorded on the left channel, the filter should be used in both channels so that 0 phase shift is maintained in the region of the notch. This is standard broadcast practice with either passive or active filters.

The circuit is designed to operate at a normal level of +10 dBm at the output of IC4, leaving 10 dB of

PARTS LIST

T1 - 600/600 Ohm for 10 dB overall gain (U.T.C. A-20 or equiv.)
600/15k Ohm for 24 dB overall gain (U.T.C. A-25 or equiv.)

T2 - 600/600 Ohm high level matching (U.T.C. A-20 or equiv.)

T3 - Power transformer, 117/36 v.c.t. at 1/2 amp. (Stancor P-8613 or equiv.)

IC1,2,3 - type 741 or 747, 1458, 1558 dual op amps.

IC4 - NE540 (utilize TO-5 clip on heat sink)

D1-D4 - 1 amp. 100 P.I.V. bridge rect. (I.R. 10DB1P or equiv.)

Q1 - 2N4923 (1 amp. 60 v. silicon NPN)

Q2 - 2N4919 (1 amp. 60 v. silicon PNP)

D5-6 - 15v., 1 Watt zener diode

All resistors as shown on schematic 1/4 Watt, 10% except where specified 5%. Frequency control pots may be 4 turn type for ease of adjustment [Bourns 3339, 50k]. Polystyrene capacitors recommended for C1, C2, .068 5% [Mallory type SX or equiv.].

headroom to the clipping level of about +20 dBm. If you know the input and output voltages of your passive filter, it is easy to build up fixed pads that will allow the unit to be employed as a direct replacement and eliminate the input and output pots. For example, if your passive filter had an insertion loss of 8 dB, and the input level was 0 dBm, the input may be connected directly to the Super Filter, resulting in an output level of +10 dBm

which would then be padded down to -8 dBm with an 18 dB pad.

If the input level to the filter is to be less than 0 dBm, change the input transformer to obtain a voltage step-up. If a 600/15 k unit is used, an additional voltage gain of nearly 14 dB can be obtained. The load resistor at the secondary of the transformer should then be changed to match the secondary impedance of the transformer used.

Try not to build in more voltage

gain than you need so that hum and noise immunity will be optimized. At the same time, though, don't be tempted to operate the unit with an input level much below 0 dBm with the 1:1 matching transformer, as too much headroom and less than optimum S/N would result.

For Non-Conformists Only

Although the standard stop tone frequency is 25 Hz, you may want to experiment with a 20 Hz cue tone if you produce your own automation tapes. If your recording and reproducing equipment can reproduce a 20 Hz tone without excessive distortion (remember that distortion components fall outside the notch), then it is possible to convert to a 20 Hz system and extend the bass response to about 25 Hz. The cue tone controlled circuits would also have to be re-tuned, of course. Many of the newer tape machines are very clean at the low end and are almost flat to 20 Hz making this type of project a real opportunity for many stations who would like to vie for the "best fidelity image". □

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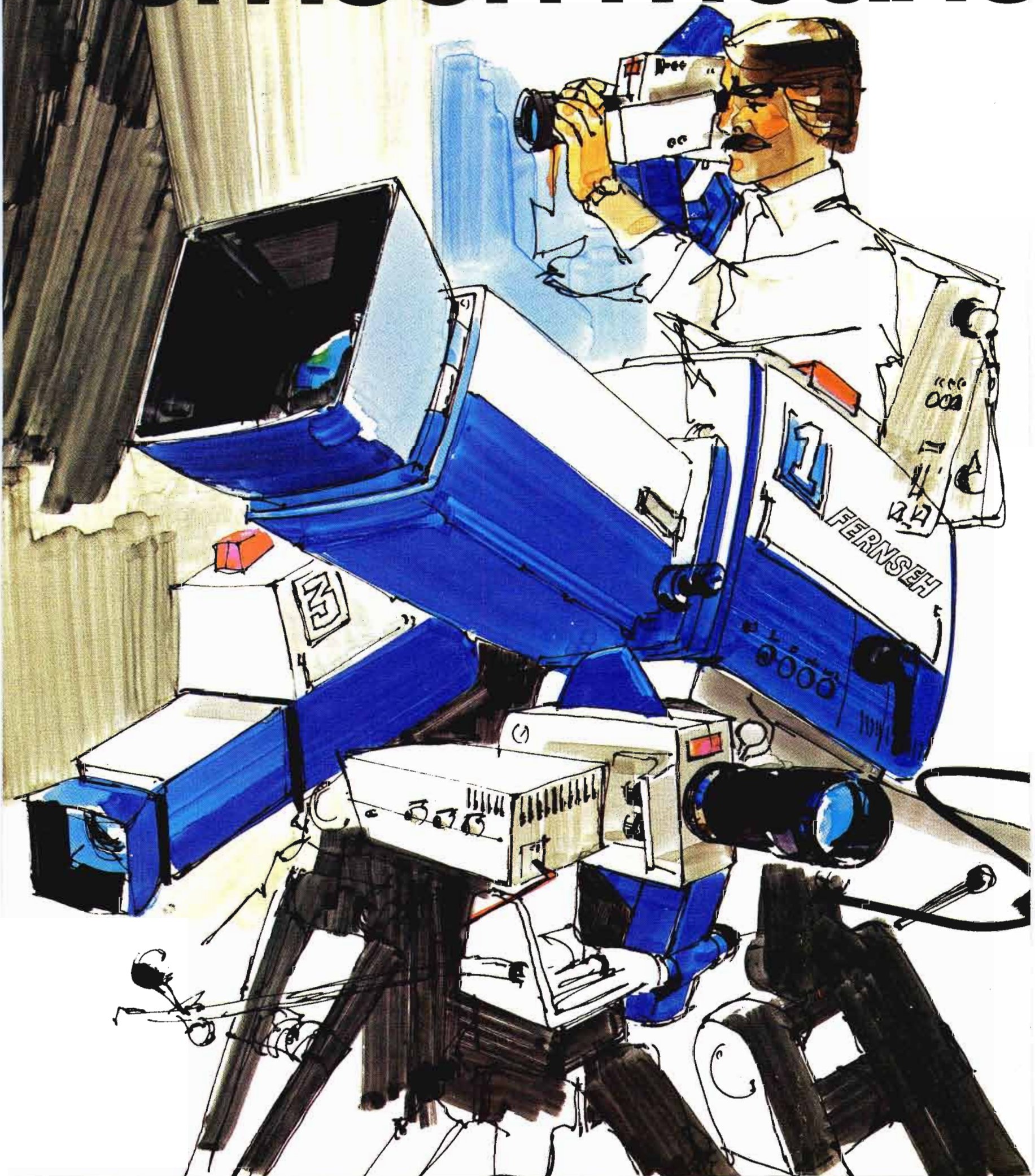
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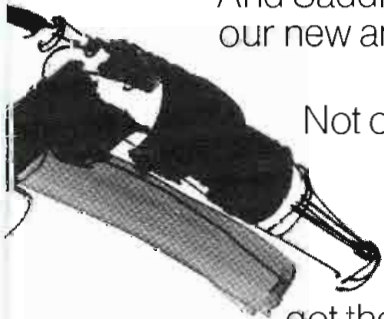
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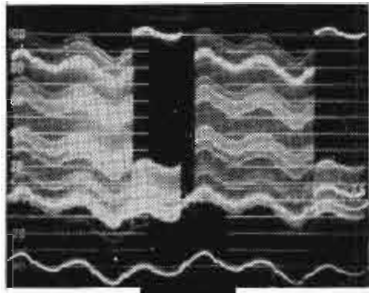


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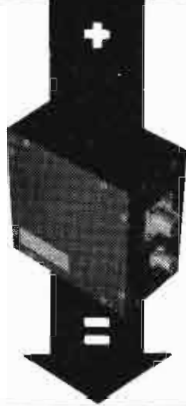
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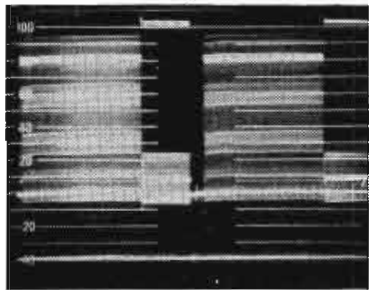
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NCTA Seeks Closer Tie With FCC

The Engineering Advisory Committee of the National Cable Television Association has initiated a new policy of closer working liaison between NCTA and the Federal Communications Commission's Cable Technical Advisory Committee (CATC).

The Engineering Committee has been redesigned by NCTA Director Nathan A. Levine, the committee chairman, to include for the first time one representative from each of CTAC's nine panels. CTAC, comprised of the top technical people in the television industry, was established by the FCC two years ago to develop and recommend technical standards for cable television.

The objective of the new engineering committee, said Levine, is to eliminate duplication of efforts between NCTA and CTAC, to strengthen the voice of the cable television operator in the deliberations of the CTAC panels and to, apart from its CTAC efforts, deal more directly and actively with the problems of the technician of the operating cable system.

Levine noted that the engineering committee will also work actively to promote national uniform technical standards for the cable television industry, will cooperate with the Federal Aviation Agency to eliminate frequency problems which might exist and will work closely with NCTA's and the FCC's Project '77 committees. Both committees are charged with reviewing the technical compliance standards which will be required of all cable television systems by March 1977.

The complete list of Engineering Advisory Committee members follows:

Nate Levine, Chairman, Sammons Communications Inc., Dallas, Tex.; Delmer Ports, staff/committee liaison, NCTA.

Frank Bias, Tele-Vue Systems, Inc., Pleasanton, Calif.; Robert Bilodeau, CTAC Panel 1, Suburban Cablevision, West Orange, N.J.; Rex Bradley, TeleCable Corp., Nor-

folk, Va.; Robert A. Brooks, CTAC Panel 7, Telcom Engineering, Inc., Chesterfield, Mo.; Caywood C. Cooley, Cable Comm. Div., Philadelphia Comm. Corp., Bala-Cynwyd, Pa.; Richard Hickman, CTAC Panel 3, Cox Cable Communications, Atlanta, Ga.; Michael P. Jeffers, CTAC Panel 5, Jerrold Electronics Corp., Horsham, Pa.; James Luksch, Texscan Corp., Indianapolis, Ind.; Henry Marron, Scientific-Atlanta, Inc., Atlanta, Ga.; Herbert P. Michels, CTAC Panel 6, Time, Inc., New York, N.Y.; John Pranke, Theta-Com of California, Phoenix, Ariz.; George Sitts, TelePrompTer Corp., New York, N.Y.; Joseph L. Stern, CTAC Panel 9, Goldmark Communications, Stamford, Conn.

NCTA POSITION ON PAY CABLECASTING ADOPTED UNANIMOUSLY BY THE NCTA BOARD OF DIRECTORS:

The present restrictions on pay television were designed many years ago for over-the-air broadcast pay television and the limited channel spectrum available.

They have no application to cable television, since the technology of cable offers a medium of abundant channels not dependent on the public air waves, and

Since the restrictions on pay cablecasting have retarded the development of both the cable and pay cable industries:

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2. During a period of 4 years, the industry shall gather such information and data as the Federal Communications Commission shall deem necessary in order for the Commission to determine whether, in the light of marketplace experience, any rules are appropriate and if such be the case, then to develop such rules and regulations as may be required.

3. Since it is not in the public interest to deprive the American consumer of the right to view sports events which are not being broadcast, the industry should have the right, under the present rules, to make such events available to the American public.

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A promising alliance

By Ron Whittaker

With the bright future of cablecasting and electronic cable services somewhat dimmed by existing legal limitations and national economic problems, many CATV operators are looking for ways to move ahead in their services without significant economic investments or risks.

At the same time there is another group with a keen interest in broadcasting which could have a lot to offer CATV and the public—the many schools of broadcasting throughout the country and their associated educational institutions.

By combining their programming and distribution resources in carefully designed working arrangements, many of the existing limitations of both groups would be overcome and a great mutual benefit could result. Presently, on both sides, however, there seem to be resistances to a combined working agreement. CATV operators, with a need to appeal to a broad subscriber base, see programming from educational institutions as being generally uninteresting and limited in its appeal. Schools of broadcasting have been reluctant to make the necessary curriculum changes to meet CATV



requirements. Some have also been reluctant to get involved with the commercial realities of the CATV industry.

The truth is, however, that these perceived problems do not need to exist, and both groups are loosing out on important opportunities by not combining some of their efforts and services.

Advantages to Educational Institutions

Educational institutions at all levels—high school, junior college, university and graduate schools—because of CATV, now have available to them one of the most effective means possible for bringing their messages, concerns, and services directly into the homes of the public. And since it is the public that is paying for the educational system through tax support, it seems reasonable to share the results and resources of this investment on as wide a scale as possible. A more direct public return on the total educational investment would be possible through a well thought out, progressive approach to CATV cablecasting. With increased public acceptance and interest would come increased public support of educational objectives.

Unfortunately, educational-informational programming has in the past fallen far short of engaging the general public's interest and acceptance. Educational programming has been dull and often not within the frame of reference of average citizens. Good educators realize that even the most important and informative television program is of little value if no one will watch it. With U.S. viewers thoroughly conditioned to commercial television, educational television producers cannot expect a public to be attracted to television purely on their terms, no matter how important or informative they feel their message is.

Old approaches to educational programming will not work. It is important that educational institutions approach CATV programmers with solid, imaginative and interesting programming proposals. Fast-paced and stimulating discussions, debates, lectures, dramas and athletic events, especially when they directly relate to community interests and issues, have been known to attract many viewers away from commercial television offerings.

Programming can also reach directly into the community for its content, as an extension of political science and government studies, and feature such civic activities as city council, school board and university regent meetings. Needless to say, the telecasting of high school, junior college and college athletic events can be highly successful.

Advantages To Schools Of Broadcasting

Even though the effective use of CATV could be highly significant to the community service activities of educational institutions in general, it could also be especially significant to the many associated schools and departments of broadcasting across the country. For CATV operators, these schools represent a major

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source of manpower and production facilities. And for students of broadcasting, a CATV alliance could represent a wealth of "real world" experience. At present, many student hours go into lab experience productions which are only viewed by the handful of production personnel involved. Many of these productions are highly sophisticated and imaginative. The motivation of advanced broadcasting students could probably be greatly increased if they know that their efforts would culminate in a cablecast to the local community.

Serious broadcasting students could also be offered internships and academic credit for their involvement in CATV programming. Similarly, students in other disciplines, such as journalism, political science, sociology, and physical education, could benefit by their involvement in other phases of CATV programming.

Advantages To CATV Operators

The existing manpower and TV production facilities, which many educational institutions now have, represents a tremendous potential in expanded community service and attractive auxiliary programming for CATV. These services, if they are well thought out, coordinated and publicized, could easily represent the "necessary extra" in selling CATV service to a significant number of subscribers. The most obvious entry

point is with local sports events. These would be cablecast "live" preferably, but could still be popular on a delayed basis, if this were necessary. (Production volunteers among broadcasting students are generally easy to find for events of this type, also.)

Obviously, CATV involvement in locally-originated programming can win respect for the station in the general area of public service. In addition, the whole area of possible tax deductions should not be overlooked.

Working Arrangements With Schools

The exact arrangement between a particular school and CATV system will probably vary in each case. Schools of broadcasting which already have production equipment—often commercial broadcast quality color equipment—may just need an offer of channel space and support in coordinating the effort. Most schools of broadcasting are already stretching their teaching personnel about as thinly as they can, and the thoughts of having to take complete responsibility for CATV productions—as highly attractive as the rewards might be—causes them to be a little less than completely enthusiastic. Here is where CATV operators may be able to meet them half-way in the total effort.

Once the program gets under way, it can be somewhat self-perpetuating, with students assuming many responsibilities for production matters. For this supervised production work the students can receive academic credit, or as the situation permits, an hourly wage.

Exact arrangements would depend upon the particular needs and circumstances; such as, for example, whether these students would be responsible primarily to the educational institution, the CATV company, or to some specified degree, or both. Ideally, each student's work would be carefully evaluated at regular intervals and his broadcast production grade would depend heavily upon his ability to perform in the CATV-school project.

These are just some of the possibilities and advantages which could come from a well-coordinated alliance between CATV and educational institutions. For many schools and CATV companies with ambitious and far-sighted goals in community service, this alliance should represent an idea whose time has come. □



Professional program production

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NEW PRODUCTS

Subscription System

The new BTVision system for encoding and decoding over-the-air subscription TV signals was demonstrated during a press conference at **Blonder-Tongue Laboratories, Inc.**, Old Bridge, N.J.

The BTVision system, the first of its kind to win FCC approval, fully is compatible with standard television broadcasting facilities. Signals are scrambled with an encoder to make them unintelligible, and then broadcast in the usual way. A small decoder, attached to the subscriber's standard television set, unscrambles both the sound and visual signals. There is no interference with or reduction of existing home TV reception when the system is used.

Isaac S. Blonder, President of BTVision, cited major advantages of the over-the-air mode as opposed to cable subscription TV systems:

The cost of the decoder for broadcast is similar to comparable service via cable. Cost per subscriber is con-

stant with the broadcast system, since each installation requires only access to an antenna and placement of a decoder on the TV set. In the case of a large city cable system, where the percentage of subscribers to a conventional CATV system is predicted not to exceed 20%, it may be necessary to pass four homes for every one that is connected, and the cost per subscriber may exceed \$500. If, as expected, only 10% of the TV homes are willing to pay for subscription TV, a cable system would need 200,000 subscribers to get the minimum 20,000 needed to break even. A CATV network this large would raise the capital investment many times above that of a comparable broadcast system.

The FCC authorized broadcast signal passes over many municipal boundaries and the STV operator can install decoders without having to secure franchises in each area. A viable economic unit can be quickly realized with broadcast signals, and is almost inconceivable for cable in most markets.

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Automatic Origination

TeleMation, Inc., Salt Lake City - based television studio equipment manufacturer, displayed an expanded line of computer-controlled television origination systems at the National Cable Television Association Convention.

Featured was the new PROGRAMATIC™ Automated Program Origination and Control System, a sophisticated computer/character generator package offering unlimited programming possibilities for automatic control and display of multiple CATV channels.

TeleMation also offered a complete line of advanced weather sensing and reporting packages especially suited to meet the needs of CATV users. In combination with the new TCG-1432 character generator, the TMM-1000 automatic weather/information system provides an accurate, self-updating television display automatically programmed to give cable viewers continuous weather information. The TMW-500B weather station uses space technology digital components and includes solid state barometer, thermometer and hygrometer. Users

can "dial-up" the weather station and obtain data via standard telephone lines.

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3-Way Splitter

I. A. Faye, V.P. Marketing, **AEL Communications Corporation** (AELCC), the CATV subsidiary of American Electronic Laboratories, Inc. (AEL), announces the introduction of a new 5-300 MHz balanced 3-way hybrid splitter, Model MSB3.

AELCC's splitter provides equal outputs, nominally, 5.5 dB below input level and is ideally suited for bidirectional systems. Models are available for strand or pedestal mounting.

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Waveform-Pulsecross Monitor Array

Ultra Audio Pixtec has made available as model WP-39 a rack-mounted combination of its low-cost, compact waveform monitor and pulse cross monitor, requiring 6 rack-units of height and priced at \$1290.

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Hand-Held Color TV Camera

A new hand-held color television broadcast camera that operates with the ancillary electronics of the widely used Norelco PC-70 color TV camera was demonstrated by **Philips Broadcast Equipment Corp.**

The head of the "PCP-70B portable camera weighs under 15 pounds and its "mini-hip-pack" less than 10 pounds. An important advantage to numerous broadcasters and production firms already using the standard Norelco PC-70 is that they can add the versatility of a full broadcast-quality hand-held camera to their facilities without purchasing an entire camera chain. The PCP-70B operates from the CCU (camera control unit) of the PC-70.

Before the first day of the NAB convention was over, Philips had affixed the call-letter logo of station WCCO-TV, Channel 4 in Minneapolis to its exhibit camera, as WCCO Engineering Director John Sherman announced the station's purchase of the PCP-70B. WCCO already uses eleven Norelco color cameras for its extensive studio and remote programming (including national telecasts of Minnesota Vikings professional football).

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CCTV Modulator

Dynair Electronics, Inc., recently introduced a new \$495 audio-video modulator designed specifically for MATV and educational closed-circuit TV applications. According to the manufacturer, the new TX-3A represents a major break-through in the price/performance ratio of modulators in this category. A conditional money-back guarantee will be offered, through participating dealers, on the new unit.

The new modulator, which makes extensive use of recent advances in integrated circuitry, accepts audio and video signals, from which it produces a standard RF television signal on a specified channel. It is ideal for adding camera or VTR signals to multi-channel RF distribution systems, since it has an internal sideband response filter. The TX-3A has excellent stability and performs well, even in 12-channel color systems.

The TX-3A requires only 1 3/4 inches of rack space, less than any other vestigial-sideband modulator. Simultaneous visual and aural percentage of modulation metering is provided and the output level is adjustable over a 10 dB range. A

remote-keying facility allows the master oscillator to be turned on or off from a remote location as is required by certain security applications. An FCC envelope-delay predistortion filter and a data filter for character generator requirements are each available at added cost.

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Time Base Corrector

The TBC-800, a fourth generation digital time base corrector for broadcast, teleproduction, CATV and CCTV videotape recording applications, has been placed on the market by **Ampex Corporation**. The TBC-800 was demonstrated at the National Association of Broadcasters Convention in Houston, March 17-20.

Charles A. Steinberg, vice president-general manager of the Ampex audio-video systems division, said the TBC-800 produces a color or monochrome video playback signal which meets FCC specifications for broadcasting.

Steinberg said the TBC-800 can be used with capstan-servoed, non-segmented helical VTRs, such as the Ampex VPR-7900 and VPR-7950. In addition, the wide window of correction allows it to be used with recorders such as the Ampex VPR-5800.

The TBC-800 is available in both stand-alone and rack-mount versions, Steinberg said. Either version requires only a single connection from the video output of the recorder. No feedback centering signal to the VTR is required.

A sync generator and a dropout compensator are standard elements of the Ampex TBC-800. Optional features include a sync pulse driver and a velocity compensator.

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Video Analyser

The CVI Model 350 Video Analyser provides a means of checking television waveforms by displaying them directly on the screen of an ordinary TV monitor. The 350 samples video information to generate a low frequency waveform and then uses a proprietary pulse position modulation technique to convert the waveform to television format. The unit also incorporates a video peak detecting mode which allows one trace to display peak values occurring anywhere within the active TV raster.

Price of the Model 350 Video Analyser is \$400 and delivery is stock to 60 days.

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Portable Color Camera

At the Convention, **Hitachi Shibaden Corporation** of America, announced the development of a new dimension in portable equipment for newscasting and TV production. The new system has been developed by Hitachi Electronics, Ltd., under the direction of NHK (Japan Broadcast Corporation). The new system consists of a compact color TV camera and back-pack video tape recorder. The battery-operated system allows for forty (40) minutes of recording on two twenty (20) minute Philips "VCR" video-cassettes.

The portable color camera employs the single-tube, single-carrier frequency division method developed by NHK Technical Research Laboratories, and the new filter-integrated

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"Saticon F" pick-up tube developed by Hitachi, Ltd., under the direction of NHK. The single-tube arrangement insures compactness as compared to multiple-tube cameras. The single-carrier method insures high resolution and signal-to-noise ratio.

The single-tube design eliminates all the controls necessary for multiple tube cameras, such as registration, white balance, etc. A specially designed electric eye zoom lens automatically adjusts lens iris for changing scene illumination. With the use of a "C" mount adapter, standard sixteen (16) millimeter cine lens may be utilized. The camera is self-contained, having no camera control unit, and weighs 15.5 pounds with lens, 1½' electronic viewfinder and directional microphone.

Cable Loss Equalizer

A VHF Cable Loss Equalizer, which compensates for tilt loss characteristics over a frequency range of 10 MHz through 225 MHz, has been announced by **Q-Bit Corporation**.

The novel device, designated model 4200, enables MATV and CATV installations to achieve substantial cost reductions by performing the functions of an amplifier and tilt control, typically required for line compensation.

Measuring 2 x 1 5/8 x 1 1/32, the passive unit compensates a 6dB tilt factor between channel 2 and channel 13, correcting for loss over 200 feet of RG-59, and approximately 300 feet of foam RG-6/U. The 4200, and companion model 4205 which provides 1 amp power passing, has good impedance match from 5 MHz to 300 MHz.

Melbourne, Florida-based Q-Bit Corporation offers off-the-shelf delivery at \$4.50 each in 100 quantities. Sample quantities can be ordered for evaluation testing. Devices are unconditionally guaranteed.

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Modular-Matic Vehicle

Ditch Witch presents its exclusive Modular-matic concept: One basic vehicle specifically designed to accommodate a wide selection of interchangeable, socket-mount modular tools.

This means that one basic vehicle can perform many different job functions simply by adding or switching modules. In many cases, the Modular-

matic concept makes it possible to reduce the number of pieces of equipment on the job site.

For example, for each Modular-matic vehicle there are several different digging modules available as well as modules for vibratory plowing the combo combination digging and plowing module, hydraulic boring, backhoe work, hydraulic breaker operations, clean-up and restoration and related accessory tools such as the hydraulic reel carrier.

Ditch Witch Modular-matic vehicles are available in the 37- to 65-horsepower range.

Ditch Witch also offers its trencher series in power ranges from 7- to 30 horsepower and vibratory plows from 25-to 195-horsepower.

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Twelve-Inch Monitor

GBC Closed Circuit TV Corp., has added a new 12" broadcast quality, solid state video monitor to its line of closed circuit TV equipment and accessories.

The new monitor, Model MV-12, provides over 650 lines resolution and contains such features as plug-in circuit modules; 100% solid state circuitry; front mounted controls; front panel screwdriver adjustments for vertical linearity, height and focus; and a regulated power supply.

All solid-state circuitry is utilized to provide maximum performance and stability, long-life reliability, low power drain and a minimum of heat. A unit featuring external sync is also available in Model MV-12-EX.

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1974

VTR REVIEW

Part 2

By Joe Roizen

Ampex Corporation have for a number of years produced a family of 1" helical recorders originally designed for the closed circuit market but eventually upgraded to encompass certain broadcast operations. From a conceptual standpoint, this recorder would appear to have most of the necessary characteristics to achieve good results in the broadcast field. The writing speed of the head—even at 50 Hz—is adequate to permit a high band signal system operating in the NTSC or PAL Mode.

It should also be pointed out that the evolution of this machine has created a number of carrier and deviation "standards" which have to be carefully adhered to if proper tape replay is to be accomplished. The latest models of this recorder include console housing, sophisticated monitoring, editing features, and direct color recovery. However, their use as broadcast production machines to maximum standards is not widespread.

Echo Science

This particular configuration of recorder is not exactly a newcomer to the field. A number of attempts to introduce this format were made a few years ago, and the recorder itself in its military reconnaissance version has been produced for years by Westel Corporation, which became Echo Science as a result of a corporate merger.

The basic approach of this recorder was to achieve extreme portability in an acquisition unit that could go out into the field with small mobile units and then replay

the tape on a matching studio unit for actual airing. The design philosophy, which is somewhat parallel to the VR 3000 approach, is to minimize the amount of circuitry in the record unit so as to keep it as small and as light as possible.

To maintain tight control of a 1" tape, a segmented helical scan is used, thereby shortening the scan path considerably. Both the acquisition and the playback unit have been demonstrated in an NTSC format. While the theoretical approach in this recorder is a valid one, there were still a number of practical limitations that were visible on the prototype machines. Nevertheless, the recorder uses an adequate writing speed to accommodate specifications equivalent to the quadruplex, and it does eliminate the major interchange problem of 1" helical VTR's, which is the long track path that is inherent in the single-head recorders. I am also not aware of any PAL version of this recorder at this writing, although there is certainly no particular reason why that standard could not be accommodated.

Fernseh/Philips

The Fernseh/Philips machine is a joint venture between two companies who have been involved in tape recording for many years, although in totally different directions. Philips has produced a variety of helical recorders for closed circuit applications, none of which has made any great impact in that field. Fernseh GmbH has been building quadruplex recorders of good quality for at least the past

eight years. Their combined experience has led to the BCR series, which is a 1" one-head helical machine.

This recorder, like the Ampex machine, depends upon a long track path for the video in order to accommodate a high enough writing speed to achieve high band signal characteristics. It is also of the omega wrap variety and uses movable guides to simplify its threading. It offers two audio tracks and a separate convertible cue or address code track; in addition, a standard control track is located between the audio channels.

The design philosophy of this recorder is rather interesting in that it accepts large time base errors out of the servo which are corrected by a wide window variable delay line technique. The machine has been demonstrated both at the 1973 Montreux Conference and at the preceding International Broadcasting Conference in London in 1972. It has been shown only in the PAL Standard and produces good quality pictures. It is compact and economical and consumes tape at about one-third the rate of a quadruplex machine; however, at this writing, there are no machines in studio operation, and earliest delivery has been quoted as beginning this year.

IVC-900 Series

The IVC-900 series also falls in the category of a 1" one-head machine in which the original design was pointed towards the closed circuit television industry. As a result,

certain parameters were selected to maximize economy and interchangeability. These included a relatively shorter scan path with a proportional drop in head writing speed to achieve this.

Compatibility between the 900 and its lower cost versions, such as the 800 and the 700, has been generally good. This series of recorders has achieved a good field

reputation as far as reliability and interchangeability are concerned, but the fundamental limitation of writing speed has required specialized circuitry for signal handling of the NTSC and PAL signals.

The most recent approach is to extract the subcarrier information and transpose it to a lower frequency, where the wavelength on tape is adequate to yield good chroma

signal-to-noise. By a careful choice of parameters, the carrier and deviation frequencies can be kept within the required spectrum imposed by the writing speed and with the combination of sophisticated electronics and high energy tape, good results can be obtained on first generation recordings.

A large number of these recorders have been delivered to broadcast facilities and are in operation on NTSC, PAL and SECAM, especially where the need for sequential dubbing is not present.

IVC/Rank/Thomson 900

The latest entry into the helical broadcast race is also a joint venture between three major companies in the broadcast equipment field. The recorder is known either as the IVC or Rank Cintel 9000 and in the case of Thomson CSF the TTV 3500. While the development work over the past two years has been conducted in IVC's Sunnyvale laboratories, it has had the benefit of both conceptual and engineering assistance from the two other firms.

The 9000 represents a hybrid between the optimum features of helical scanning and segmented image format. The recorder was designed from its inception to equal or exceed electrical signal specifications of the quad machines by employing a super high band system with carrier and deviation placed between 9 and 12 MHz.

In relation to the PAL Standard with its 4.43 color subcarrier, this provides a better level of moiré performance than has been available up to now. In addition, some other signal characteristics have been enhanced.

The use of 2" tape running at 8" per second provides a significant economic advantage in tape consumption while still having adequate tape width to easily accommodate five longitudinal channels. Since the image is segmented, the 9000 requires signal handling, switching and time base correction techniques similar to the quadruplex, although simpler by at least a factor of two. The philosophical approach to the 9000 was to provide a studio machine with the

(Continued on page 36)



Fig. 1 Dick Fletcher of CVS holds an Akai color camera connected to a portable recorder—one of the economy approaches to electronic journalism. Doubtless, competition to gain dominance in the portable market will bring on even smaller and lighter models. (Photo by Donna Roizen)

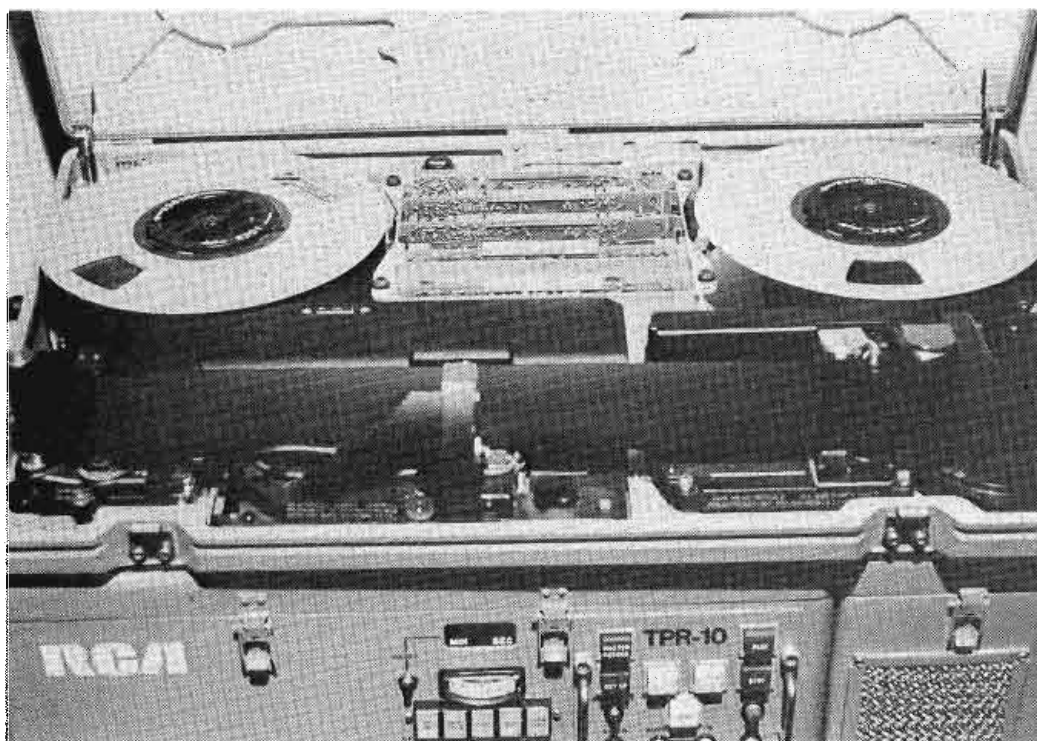


Fig. 2 Portable quad is possible with this compact RCA TPR-10.

Electronic News Gathering Steam

In an electronic news-gathering first, CBS News sent the camera to the Middle East (the only live camera aboard the White House press plane) to provide coverage of President Nixon's visit there. Portable live cameras have never been used for a major overseas news story before, according to Davidson, and the real-time coverage provided another example of the immediacy and flexibility of electronic journalism.

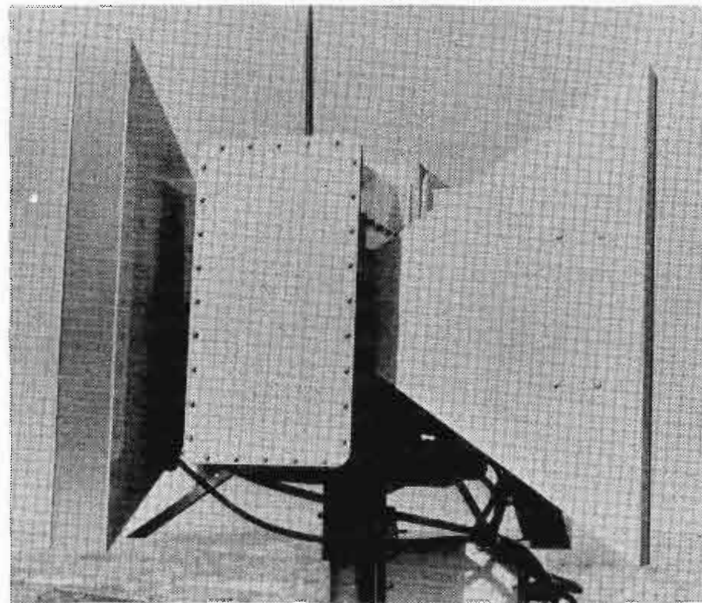
Recordings of the output of the camera were made on an IVC-100 portable videotape recorder. Davidson says that the gathering of national and international network news often requires a compact, hand-held camera, which can be easily placed in a crowded conference room or transported to a remote news site. He adds, "This compact, lightweight Ikegami camera allows our news crews to move freely and quickly anywhere, anytime, to cover a breaking story—a recent example being the news vigil outside the Hearst mansion in San Francisco, where we scooped other news crews who were using film cameras."

Beindorf stated that the main advantages of electronic news gathering at the local station is the immediacy with which news events can be broadcast. Another example of the effectiveness of the live coverage provided by a WBBM-TV Chicago news crew was of a train wreck on the city's transit system. Pictures were broadcast simultaneously with the first radio reports. The accident occurred at 6:22 PM, and the camera crew was on the air live at 6:44, during the evening news. Other stations were obliged to transport their film back to their stations, to process and edit the material for their 10:00 PM, news programs. Some Chicago officials who could not get to the scene kept abreast of the situation from their television sets tuned to WBBM-TV.

Beindorf also stated that by getting the story back in real-time by microwave link, "we find that we can gather news stories much closer to air time, and still perform the necessary editing and composition."

August, 1974

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VTR Review

(Continued from page 34)

maximum performance characteristics while reducing operational and economic factors.

A Rank Cintel 9000 and a Thomson TTV 3500 were exhibited at the recent Montreux Conference, where the machines showed full interchange on 100% PAL color bars and also displayed good quality pictures from tapes made at ATV in London and ORTF in Paris. The Rank machine is scheduled for demonstrations at the Australian IREE in Melbourne. The machine has also been positively evaluated recently by the British Broadcasting Corporation in London. The IVC-9000 in an NTSC version was first shown at the SMPTE Fall Conference in New York last October.

Sony Version

Sony Corporation, has on a number of occasions, announced the availability of a broadcast version of their 2" helical recorders. Nevertheless, none of these machines in the PV series seem to have found their way into actual broadcast use. The latest such announcement is called a Sony MV 10000, which uses 2" tape and a single head, single field recording format. Tape consumption is at 7½ ips, and apparently chromium dioxide tape is needed to achieve the required electrical specifications because the writing speed on this recorder is under 1,000 ips.

This recorder falls in line with the Sony philosophy of the head and a half approach, one head being the major video recording channel, while a second displaced head takes care of filling in the vertical interval so as to eliminate the video dropout at the crossover point. To the best of my knowledge, no such recorders are in any broadcast use at the present time.

Confusion Of Choice

As stated in the introduction, the "confusion of choice" confronting engineering management in a broadcast television operation with regard to the selection of video tape recorders is ample. Without question, the simplest path lies in continuing with available quadruplex equipment, thereby maintaining a standard which is relatively well-established and whose problems are

being coped with on a daily basis.

Unfortunately, an examination of the cost and the complexities, especially when color is concerned, of continuing with this standard very quickly shows that the operational and economic factors related to the emerging helical broadcast VTR's cannot be easily ignored.

In making some detailed analysis at the major network level, it was obvious that significant savings could be achieved if the archival libraries were transferred from their quad format to one of the helical systems. Not only can there be a saving in the storage value of the medium, but also an improvement in space requirements and speed of acquisition of particular archival segments.

A completely separate analysis made with regard to the basic cost of consumables in a medium size network affiliate station also gave some interesting results. In this case the consumables were considered to be those items related to video tape recording which the station used up in the course of one year's operation. This included the tape itself, which was cycled to disposal, the cost of video head replacement, the cost of maintenance, including such things as repetitive set-up times, etc.

While these factors may not greatly interest the purely engineering type, they can hardly be ignored by television studio managers who must maximize their operations within the constraints of budget limits.

There are, of course, a few precautions that must be observed for selecting VTR's for broadcast applications. It would, for instance, be pointless to populate one's VTR room with one each of every kind that is available. To go from this ridiculous situation to one somewhat more sublime would be to select the kind of VTR that meets the bulk of the studio's needs and at least standardize on that format for the major part of the operation. This would leave only some peripheral activities where some degree of non-standardization is acceptable, if it contributes to the expediency of that particular requirement. □

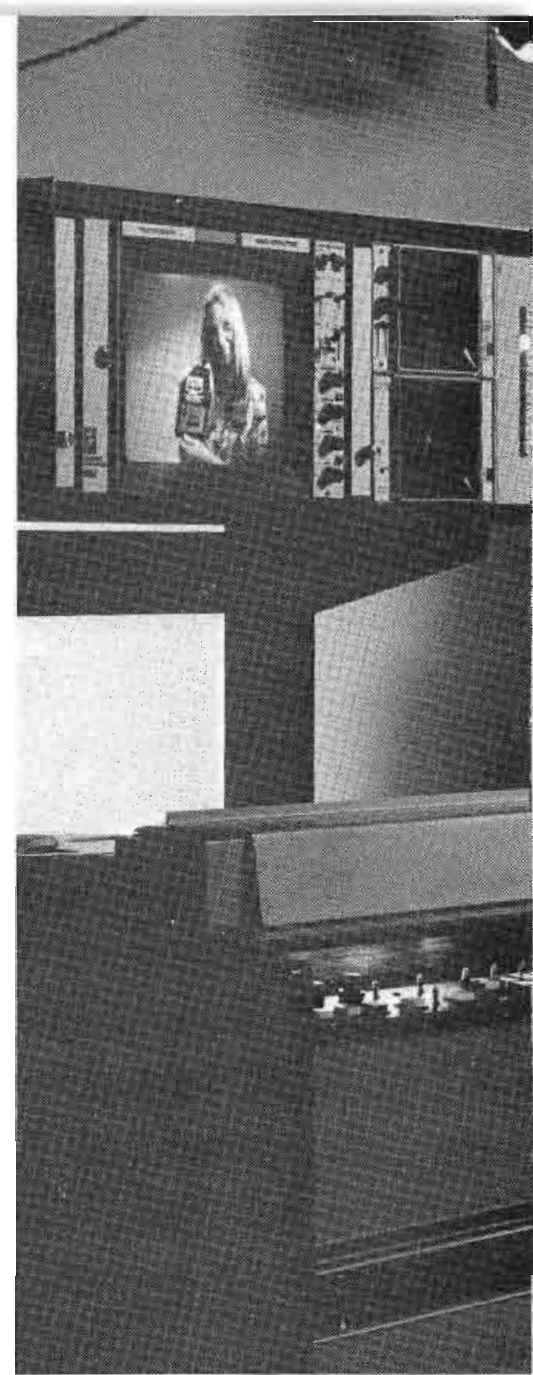
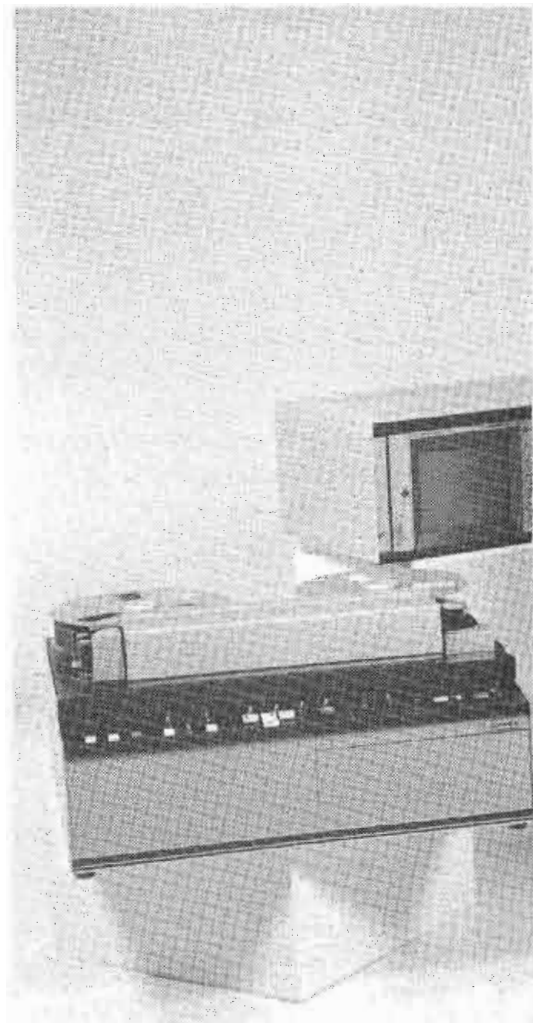


Fig. 3 This is the latest Ampex quad machine. It was demonstrated at the latest NAB convention.



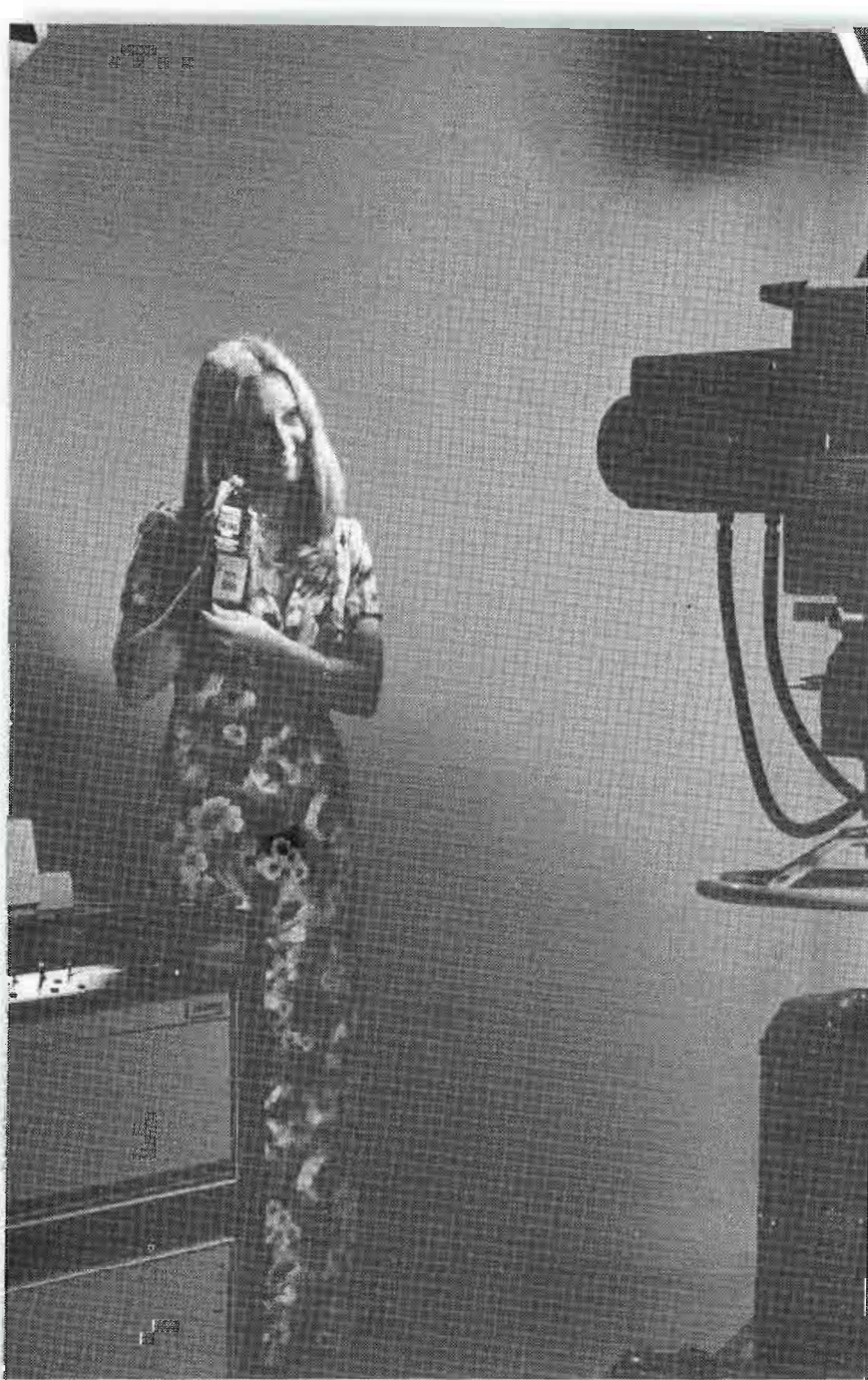


Fig. 4 Appealing to the need for portability, the Ampex machine can be dismantled and loaded into anything from a panel truck to a van.

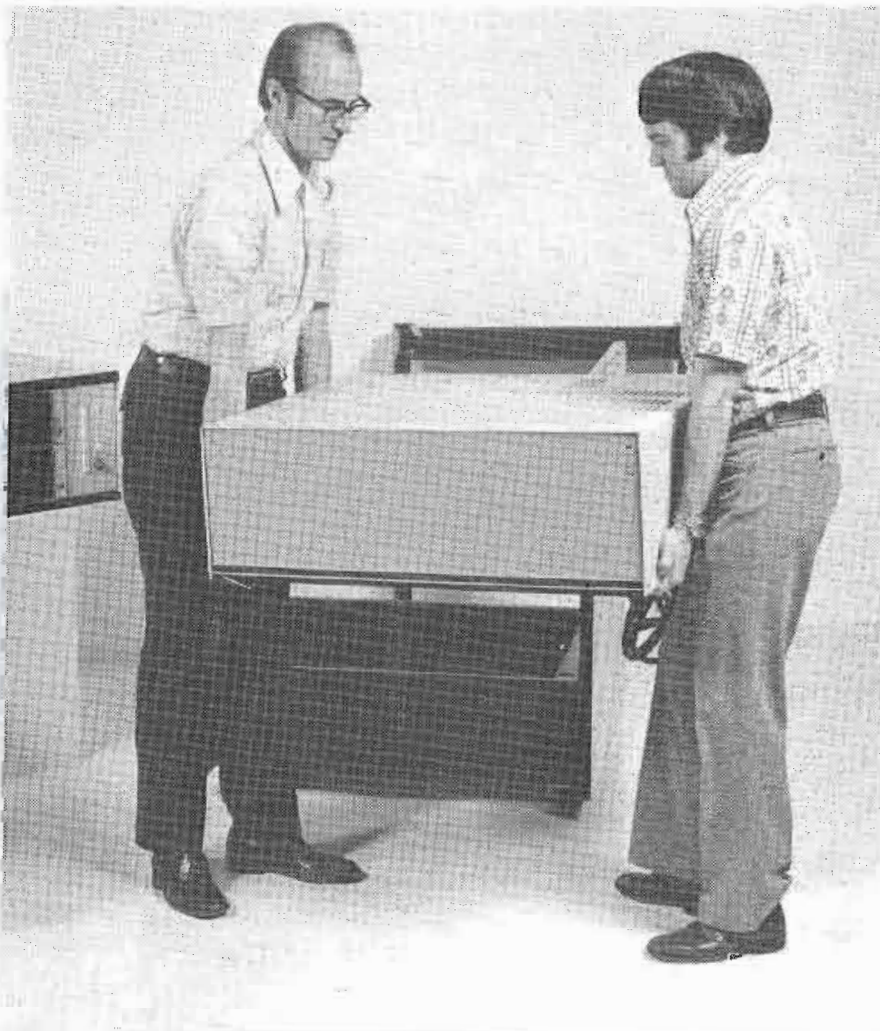


Fig. 5 Like the smaller Ampex machine, this RCA model was introduced at the Houston convention.

Fig. 6 This is the IVC broadcast quality helical recorder that has drawn so much attention.



Arrest that surge

By Pat Finnegan

Besides carrying the AC power to operate the broadcast station, the powerline can also conduct undesirable elements to the building from the outside. The intruders may be in the form of transients, RF interference, and power surges. The surge is by far the most dangerous and destructive of these unwanted intruders.

Line disturbances may originate at many places or caused by severe weather. Heavy industrial switching devices can send out transients on the line. Power surges can happen if highlines swing together during a wind storm, or an auto accident may shear off a pole snapping a line, but the most frequent cause is lightning. Besides a direct hit, surges can be induced on the line from nearby lightning discharges.

With the conversion of broadcast stations to solid state equipment and logic control devices, these line disturbances can no longer be ignored. Transients can cause logic circuits and memory banks to do strange things, while a strong surge on the powerline can destroy many sensitive solid state units in one swoop. To make matters worse, some solid state elements may only be overstressed during the surge, and not fail immediately. Failures may occur intermittently over a period of days or even weeks.

Nature of Surge

A surge on the powerline will take on the form of a transient and during a brief interval will transmit unbelievably high voltages and currents along the line. In shape, it will start with an abrupt, very steep wavefront cycle, possibly followed by one or more cycles of diminishing amplitudes. Arrester specification sheets will often describe the surge by a two number designation, for example: a 10 x 20 microsecond surge current. The first number describes the time from start of wave to the peak of the first cycle, and the second number is the time from start of wave to point wavetail (half the value of peak). Both are timed in microseconds.

The Need

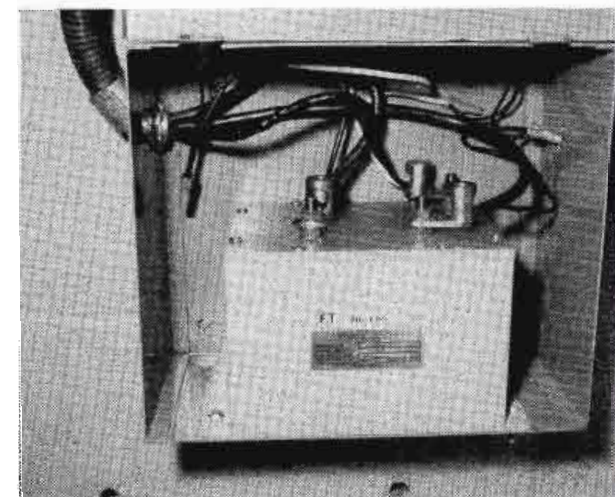
The tremendous and dangerous potentials present in the surge should be diverted to earth ground as quickly as possible before they can enter the building internal wiring and distribute throughout the entire station. The most logical place to accomplish this effect is at the power line entrance to the building with a single protection device. Each sensitive solid state device may be protected individually at its own chassis, although this usually is not necessary. Should the high potential surge currents be allowed to distribute throughout the building's internal wiring, hazards can develop at the most unpredictable locations. And although a piece of equipment is protected at

its own power terminals, a large surge can cause a flashover from the rack to the equipment causing damage or destruction.

The Arrester

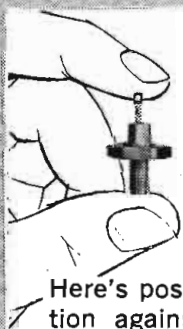
The device used at the powerline entrance may be called an arrester, surge protector or some other name. Regardless of name, they all generally fall into the category of a "crowbar" circuit. That is, when the surge turns the device on, the powerline is shortcircuited to ground for a very brief period of time. The arrester should be able to clamp the surge to a very low value or to zero voltage within 1/2 cycle of the AC powerline cycle. A typical commercial unit can clamp an applied 20 kV surge to zero voltage in less than one microsecond.

When the arrester does turn on, very high currents flow through it. These currents are supplied by the surge itself and also from the powerline. The current that flows from the powerline is called **power follow**. It is most important that the arrester be able to turn itself off after the surge has passed, or the power line will continue to flow through it. The nominal operating voltage should not turn the arrester on, nor should there be wide fluctuations in the powerline voltages. The greatest concern, however, is the ability of the arrester to turn itself off after the surge. Should the



Surge arrester mounted in protective box (door not normally open). This unit is in use at WLBC.

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Management Highlights

The surge protection unit pictured in this article is certainly not the only one available. It was used as an example. Wilkinson Electronics, Inc., and Sintronic are probably two of the best known manufacturers of surge protection units.

Wilkinson has a pulse compensated line surge varistor that is placed across the line. If a surge occurs, the resistance of the varistor decreases at a log scale as the voltage increases, so it acts as a momentary load or short circuit to the surge. These line protectors draw little or no current. Wilkinson's unit is capacitor compensated for microsecond surges.

Sintronic units can be installed across the power line entrance or between the plate contactor and the transformer in the transmitter. All varistor protectors are a necessity today because of the switch to solid state rectifiers and other solid state components.

MCG Electronics has available lightning, transient, and surge protection for hi-low voltage/current requirements involving AC, DC, pulse or signal applications.

Other line surge protector manufacturers include: C-Cor Electronics, Collins Radio, Cook Engineering, Gates, and Mastertone. For addresses of these companies, see our ad index in recent issues or refer to our annual buyer's guide issue, September, 1973.

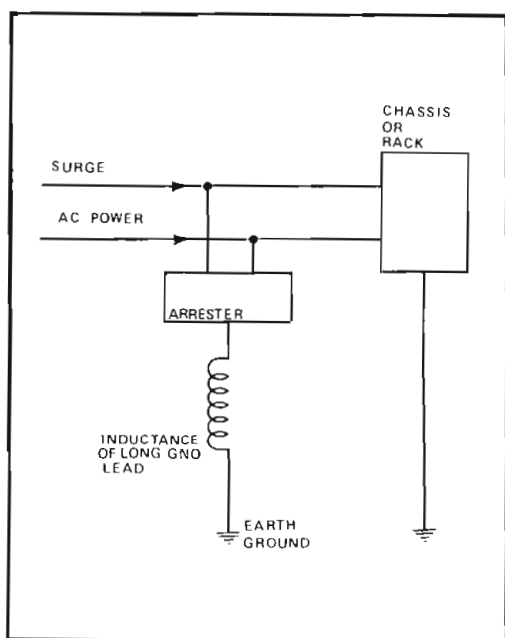


Fig. 1 A very long ground lead will have inductance that can create very high inductive voltages during passage of the surge current. Flashovers are possible to other objects or rack frames.

normal operating voltage of the powerline (or its high excursions) be near the upper rating of the arrester, there may be difficulty turning it off after a surge.

Grounds

There can be several thousand

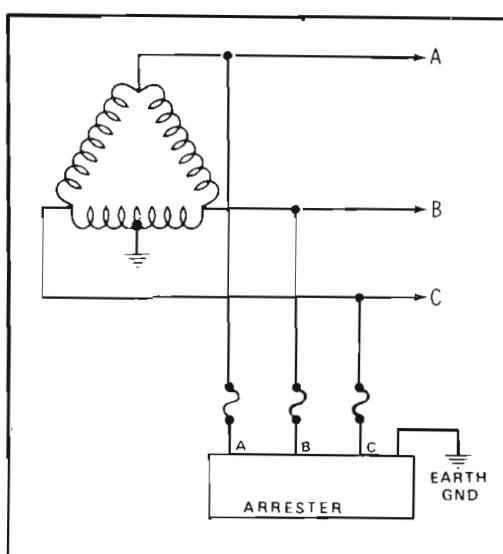


Fig. 2 Typical transformer secondary connections for both single and three phase. The closed delta is the same as the open delta, except that it uses the third transformer. The voltages you measure at your station may be higher or lower, but the ratios will hold true.

amperes of current flowing during the surge, so the ground lead should be heavy, offering low resistance. The lead should be short, otherwise, the lead inductance can become a very important factor. If this lead must be 20 feet or longer, inductive voltages of 50 kV to 100 kV can

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Sintronic Line Surge Protectors may be placed at the power line entrance, protecting all equipment at the site, or they may also be installed between the plate contactor and the transformer, in a transmitter. In this application they will protect the high voltage rectifiers from surges, will absorb the magnetic discharge of the plate transformer when the circuit is opened and will prevent arcing at the plate contactor or circuit breaker.

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A WILKINSON pulse compensated Line Surge Varistor, is placed across a line of its rated voltage. Should a surge or increase of voltage occur, the resistance of the varistor decreases at log scale as the voltage increases, thus acting as a momentary load or short circuit to the surge. WILKINSON Line Surge Protectors draw little or no current and are capacitor compensated for microsecond surges, thus damping all line disturbances as well as excessive voltage increase.

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Model SIA-3 220 V. Three phase \$395.00

Model SIA-4 440 V. Three phase \$495.00

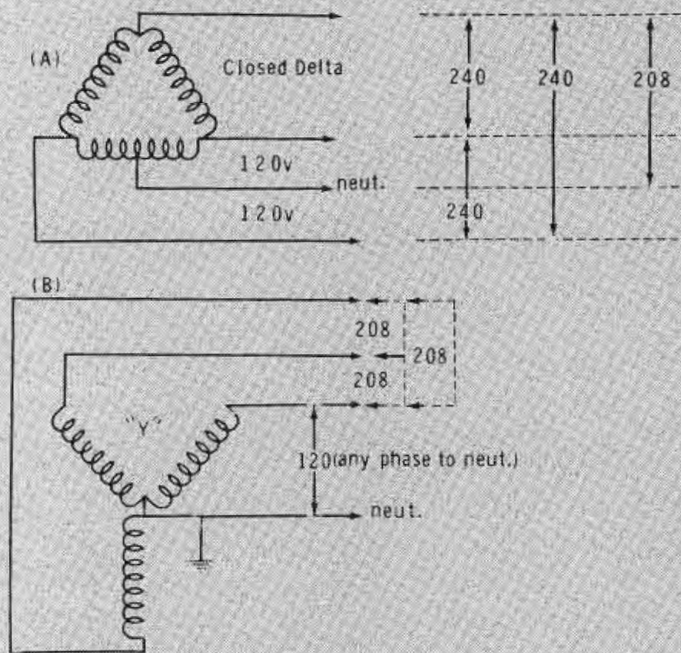
For complete details write to:

WILKINSON ELECTRONICS, INC.

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• TELEPHONE (215) 874-5236 874-5237

Fig. 3 Typical arrester connection of a three-phase closed delta. The fuses should be special slo-blow types.



easily develop at the current passage. There are two ways of lowering this lead inductance: shorten the lead, or run one or more leads in parallel. These inductive voltages can be just as destructive as voltages developed across the lead resistance.

Commercial Units

Several arrester models are available commercially, made by several companies. These units are not identical either in principle of operation or in the materials used, although they all strive for the same end. The arrester made by Dale, Inc., for example, makes use of a pre-ionized arc chamber surrounded by a magnetic coil. There are other materials and methods used, such as the metal oxide varistor (GEMOV)² a product of General Electric Co.

The Power Circuit

Power distribution throughout the country is not uniform, and there are several transformer connections that are in use. Much will depend upon the custom in your area and the actual requirements of your station. For selection of an arrester, you need to know what is actually in use at your location. Unless you have this information on hand, a call to your power company will provide the information from their records—provided their records are up to date. If their records

are not up to date, they will usually send an engineer out to survey your installation and give you this information. They also prefer to have their own records up to date.

For your own information make a visual inspection of the pole transformers (may be on the ground in an enclosure.) Then sketch the wiring connections of the transformer secondaries. Carefully observe how many wires go into the weatherhead at the end of the down conduit. There may be several transformers and several down conduits. This can be the case if both 3 phase and special, separate single phase are in use. Note which power panels each of these conduits feed.

As a further check to verify your observations, make voltage measurements at power panel or panels. When both three phase and single phase are obtained from the bank, the secondaries may be in either an open or a closed Delta configuration. In the open Delta, only two transformers are used and one of the two is center tapped to provide 120V single phase each side of the tap. The same arrangement is used on a closed Delta, except three transformers are used. In either case, you should measure 120V each end to the center tap of the one transformer, but from the end opposite the center tap, the voltage will measure 208 Volts. End to end across each pair of hot wires will measure 240 volts. That 208 Volt

reading is what is called the **high phase**. Your actual readings may be either higher or lower than these, but the ratios will hold true.

Measuring these voltages are important for selection of an arrester. Besides this measurement, other measurements should be made at periods of high and low loads on the system so that you can arrive at the nominal values in use and especially the high excursions. Here again, the power company will place a recorder on the circuit at your location for a 24 hour period.

Installation

Unless you are an electrician, it is best to leave this job to one. In many areas of the country, only a licensed electrician may do this work.

The arrester should be physically mounted and wired as close to the power entrance as possible. If the Electrical Code will allow, have it connected to the incoming lines ahead of the main breaker. If this is not possible, the main breaker

should be a slo-blow type so the arrester can operate without tripping the main breaker. In either case, the arrester should have its own disconnect and fusing (special slo-blow fuses).

Some units have a life span and at the end of the period will short out. This is the main reason for the arrester fusing. Most units also do not have an indicator on them. You can mount small neon lamps on the load side of the arrester fuses. These will glow if the fuse is good and the power on. But should the fuse open, it will indicate that protection is no longer in the circuit.

The ground lead from the arrester to earth ground should be as short as possible to reduce the possibility of inductive voltages during a surge. This ground lead should also have an insulated covering, rather than bare copper. Should voltages build up on the ground lead, this will give added protection against flashovers to other objects. If the lead must be long, run one or more leads in parallel with the main ground lead. These too should be covered with an insulating material.

Maintenance

There is very little to do in the way of maintenance on an arrester. If the unit has open terminals (unit enclosed in a box), dust and debris should not be allowed to collect—either here or in the fuse box. A vacuum will clean this out, but turn the power off first as a safety precaution. Never get careless when working in these power panels—the voltages are lethal. As this is the power entrance, the conductors and main circuit breakers are very heavy and can carry large currents. Accidentally getting a metal tool across two of the phases can cause a blinding flash which is an electrical flame. Even though you don't contact the voltage with your body, the flame can produce a serious burn and it can damage your eyes. □

¹Trademark of Dale Electronics, Inc.

²Trademark of General Electric Co.

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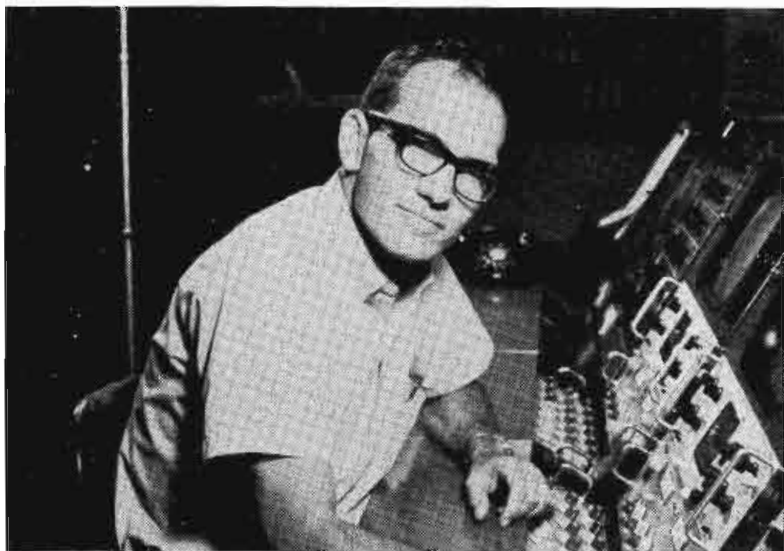
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bookreview

With **Electrical Wiring & Lighting For Home & Office**, anyone who has any knowledge of electricity can do complete home or office wiring jobs, including installation of interior and exterior illumination systems.

The author, Edward L. Safford, Jr., starts with a simplified description of an electrical system and why and how it works, then goes on to explain the whys and wherefores of electrical codes. In addition to showing how to wire a house, and describing basic tools, test equipment, and simple tests, the book is loaded with pictorial examples of practical wiring, wire size tables, conduit sizing, etc. Within the basics of electrical systems, the author defines feeder lines, circuit symbology and overload criteria, voltage, amperage, wattage ratings vs. wire sizes and insulation types.

Also included: how to locate individual circuits in existing wiring, common types of house wiring circuits, typical wiring layouts, hints and tips for using fixtures for eye ease, mood making, and interior and exterior "lightscaping." Exterior wiring is then described, tied in with intrusion alarms, photocell and relay uses etc.

Another section covers thermostats and timer clock circuits, air conditioners, water space heaters, and direct and remote control systems. Great stress is placed on **safety** for the individual and for fire prevention, with many examples provided of Do's and Don'ts, keyed to the National Electric Code, various general rules and regulations, and common sense.

This book is available from Tab Books, Blue Ridge Summit, Pa.

For More Details Circle (50) on Reply Card

Basic TV Staging, written by Gerald Millerson, is a compact yet comprehensive summary of TV staging mechanics and methods. Techniques and procedures that would take years to pick up by personal experience are explained and shown in this book, step by step and in a wealth of detail.

It is packed with imaginative, labor-saving and low budget ideas. But is also includes the most recent methods of presentation from open cyclorama to the wizardry of electronics.

This book is available through Hastings House, Publishers, New York, N.Y.

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NEW PRODUCTS

The Glitch Fixer

A new basic instrumentation tool for design and repair of digital logic circuits has been introduced by **Biomation**. It is the 810-D Digital Logic Recorder, nicknamed The Glitch Fixer.

Designed specifically for analysis of digital logic, the 810-D can be used for synchronous and asynchronous signals and can capture random logic pulses (glitches) as narrow as 30 nanoseconds by means of an input "latch."

The Biomation 810-D features eight logic signal channels with megohm inputs. It presents 8 X 250 bits of recorded data on any scope in the form of an easy-to-interpret timing diagram. Logic thresholds are selectable, including EIA and TTL levels. Takes synchronous clock inputs to

10MHz and has internal clocking selectable from 20Hz to 10MHz.

For More Details Circle (60) on Reply Card

Peak Program Meter

Quad-Eight Electronics has introduced their all solid-state Peak Program Meters, the PK-14 and PK-16.

Both PPM's give precise visual level indication via sequentially lighted LED readouts of true signal levels. A 14 or 16 green and red segmented readout will monitor standard VU or Peak Level program content depending upon the user's preference in selecting its alternate mode operation by a front panel control setting.

Integration time specifications conform to European DIN 45406 for peak reading and USA C16.5-1954 for VU characteristics.

The PK-14 arc-scale meter is designed to retrofit into existing 3 1/2" meter installations, while the vertical scale PK-16 will offer new monitoring capabilities in updated or custom designed control consoles.

Delivery from stock will be made approximately July 1.

For More Details Circle (61) on Reply Card

Dual Trace Triggered Scope

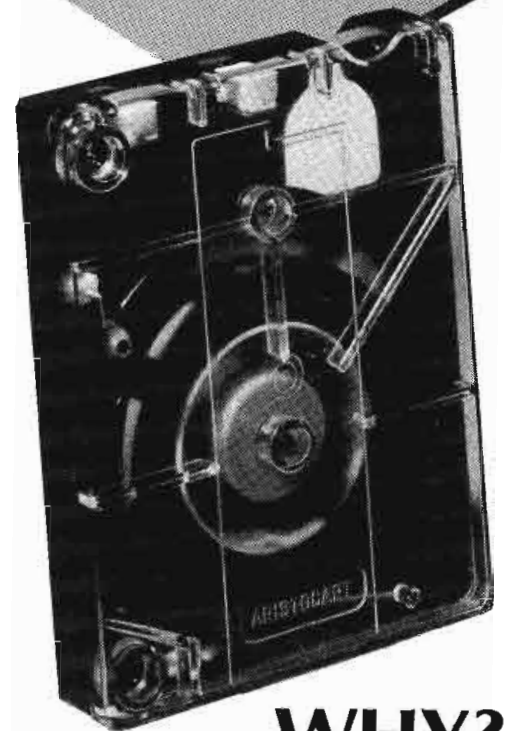
Systems Electronics, Inc., Inglewood, Calif., has introduced two new portable, solid-state precision DC-to-15 MHz triggered oscilloscopes. Available in two models, at prices that are up to \$100 less than comparable models now on the market, are single-trace Systems Scope Model 77 and dual-trace Systems Scope Model 87.

The "human-engineered" units include color-coded vertical and horizontal controls for rapid reading, plus an "easy-grip" carrying handle that doubles as a three-position tilt stand, as well as a pressure-fitted "pop-off" vinyl finished cabinet requiring no tools to open for servicing.

More than laboratory tools, these light-weight units can be used for a wide range of production-line, industrial, scholastic, research, electronic servicing, and consumer industry applications.

Other features of the Systems 77

in recent months most major FM radio stations in North America have switched to this cartridge...



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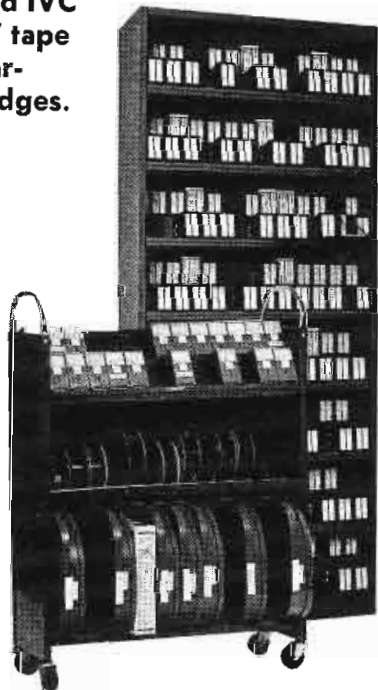
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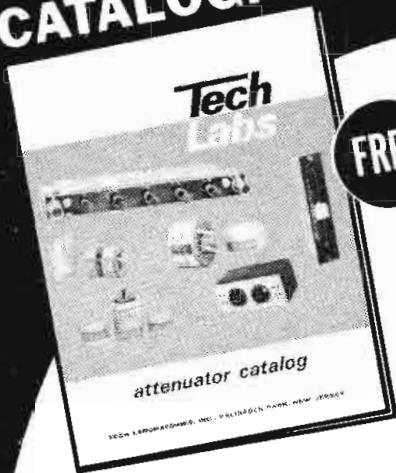
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and Systems 87 scopes include: high reliability and simple operation; a flat-face 8 Div. x 10 Div. CRT; full 15 MHz bandwidth for high frequency use; vernier controls on the Systems 77 model and push-button controls on the Systems 87 model; and a Vector Scope capability for displaying color signals in vector form.

The units are available for either 115 or 220 VAC, 50 or 60 Hz inputs, as desired. Compact construction results in small size and light weight. The units measure 4-7/8 inches high, 10 inches wide, and 14-5/8 inches deep. The Systems 77 model weighs 14 pounds, while the Systems 87 weighs 87 pounds.

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**Rubidium
Frequency Standard**

FRK a rubidium frequency standard produced by **Efratom California Inc.** is the worlds most miniaturized atomic clock: extremely small size (3.9" x 3.9" x 4.4"); light weight (2.2 lbs) and low current drain.

Long term frequency stability, better than 1×10^{-10} are guaranteed by the manufacturer. Other prominent features are spectral purity, high signal to noise ratio and short warm up time of only 10 minutes to reach

accuracy of 2×10^{-10} at 25°C ambient.

Due to its small size and low price, the FRK unit can be used anywhere the quartz crystal has been used in the past, thus obtaining 50 to 100 times better stability. Any electronic apparatus requiring a highly stable frequency source can now be made small in size and easily mobile when maintaining the benefits of the precision inherent in atomic resonance controlled frequency standards.

For More Details Circle (63) on Reply Card

**Automatic
Cassette Duplicator**

Cetec, Inc., has announced the expansion of its line of high speed duplicating systems with the introduction of the Copy-Cass II Automatic Cassette Duplicator. The desk-top unit is designed and manufactured by the North Hollywood Company.

Operating at 20 IPS, the Copy-Cass II duplicates a cassette master on up to fifteen blank cassettes automatically at one loading and signals the operator when the duplication job has been completed.

In normal use, stereo tracks are recorded simultaneously. Monophonic tracking also can be selected alternatively by the touch of a pushbutton switch.

The Copy-Cass II utilizes a unique silent-sense logic system which senses the end of master program, automatically causes both the master and the duplicated slave cassette to be rewound, then ejects the completed duplicate before beginning the next duplicating cycle.

For More Details Circle (64) on Reply Card

**Tape Tension
Control**

Accurate control of tape tension for steady speed is provided by **TENTROL**, just introduced by **Inovonics, Inc.**, of Campbell, California.

Tentrol, provides constant tension from beginning to end of any size tape reel by controlling the torque of the supply-reel motor. The unit consists of a reel speed sensor and control circuitry and can be installed easily in the field.

Tentrol eliminates tape speed changes, and thus changes in pitch, with tape reels as large as 14 inches. This allows duplicators to use larger reels on slaves without loss of quality. **TENTROL** also extends head life by eliminating excessive tension, and improves high-frequency performance by reducing azimuth and head contact variation.

An additional **TENTROL** unit can be installed on the takeup motor to

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provide constant takeup tension as well. Two units can provide fast starts at 30 ips and eliminate capstan creep.

For More Details Circle (65) on Reply Card

Computerized Lighting

A lighting control system that incorporates a computer memory is now available from **Berkey Colortran, Inc.**

Dubbed the Colortran Memory Center, the system can control over 500 dimmers and 1000 scenes, up to eight simultaneous crossfades and up to 18 submasters in groups of six. Instantaneous manual override of all functions is provided, negating the need for matching. The system's exclusive store fade time feature eliminates setting during playback. Up to six Alpha scenes may be inserted between each existing scene. The Memory Center also allows for automatic sequencing of randomly numbered scenes.

The Memory Center is completely modular in design. Basic units are scene, fade, dimmer and submaster modules, and status displays.

The "brain" of the Memory Center is its system control unit (SCU), a modular, microprogrammable controller designed and manufactured for Berkey Colortran by Xerox Data Systems.

For More Details Circle (66) on Reply Card

Sweep/Function Generator

A new low-cost sweep/function generator in the price range of low frequency sine-square oscillators has been introduced by **Exact Electronics, Inc.**

The Model 195 is expected by its manufacturer to make new inroads into audio testing, amateur electronics and educational markets never before served by low cost, high performance function generators.

The new instrument, housed in a compact, rugged case, produces sine, square, triangle and swept waveforms as well as fixed amplitude pulses. Its frequency range is from 2 Hz to 200 kHz in three ranges with a linear/logarithmic frequency control.

An internal sweep generator will sweep 1000:1 (3 decades) on any of the 3 main frequency ranges. This permits audio technicians to sweep either linearly or logarithmically, the entire audio range of amplifiers or speakers without changing ranges or even turning a knob. The Model 195 has three 1000:1 sweep rates slow, medium and fast. High and low level sine outputs with amplitude control of

both are provided. A voltage control frequency (VCF) input permits controlling frequency from an external source.

For More Details Circle (67) on Reply Card

Identification Unit Uses Video Titling

A camera identification module, designated CID-10, has been announced by **Datavision, Inc.**, a manufacturer of video character generators.

Now, an operator can switch to each camera's field of view on the master monitor (or a single monitor) and have its position clearly identified on the monitor's raster. At position one, "Camera No. 1" appears; at position two, "Camera No. 2"; and so on through up to ten camera positions.

The single-row display of Model CID-10 consists of 16 characters, fourteen programmable alpha characters and the last two numeric, 1 through 10. Model CID-10/8 provides 8 positions. Model CID-10/4 provides 4 positions. Each position is easily programmed by the customer with strap connections.

Character height is adjustable in steps of: 18, 36, 54, 72, 108, or 144 scan lines. Display width is adjustable. Message can be positioned vertically or horizontally anywhere on the screen.

Modules operate in conjunction with a sequential video switcher of the Auto-alarm type, or switcher with a contact-closure output at each switch position. Unit accepts a variety of sync or video sources and includes internal non-additive mixer for combining message and picture.

For More Details Circle (68) on Reply Card

Pulse Generator

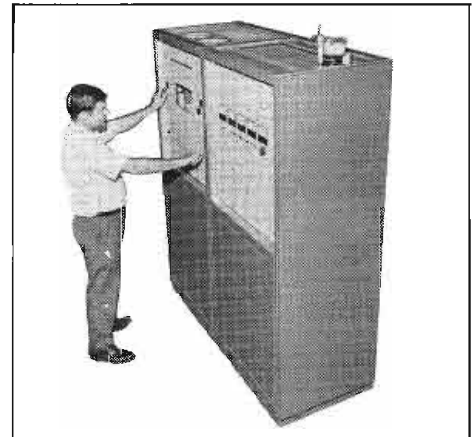
Two new low-cost **PHILIPS** pulse generators have been announced by **Test & Measuring Instruments, Inc.** The new instruments PM5704/5705, available from stock, for only \$390. each.

Their economical price is expected to give wide application in laboratories and on all educational levels.

The main pulse output of the PM5705 has a higher amplitude than normally found in generators of its class. The 1.0V to 15 V pulse amplitude is more than sufficient for TTL, HNIL, and MOS applications. The PM5704 is basically the same instrument as the PM5705. The difference is the PM5704 has a DC output for TTL circuits instead of the 15V pulse output.

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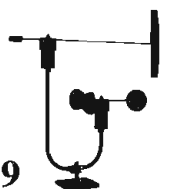


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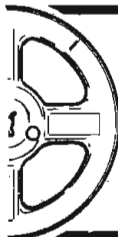
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For More Details Circle (41) on Reply Card

Both have features such as duration; 50ns to 500ns, internal triggering from as low as 0.1 Hz and as high as 10MHz variable in 8 ranges with continuous control within the ranges.

The PM5704/5705 are examples of PHILIPS high standard of engineering and reliability. Both are built with integrated circuits, reducing the amount of components used, and inputs and outputs are protected.

For More Details Circle (69) on Reply Card

Genlock Sync Generator

SHINTRON announces its new Genlock Sync Generator for Helical VTRs: Model 312 Helical Genlock RS-170 Sync Generator. Shintron's Model 312 has dual features: internal sync source (quartz crystal clock generated) and Genlock. Internal sync generator produces RS-170 sync signal. In Genlock mode it locks onto ordinary helical VTR output. If the Genlock source fails, the Model 312 switches automatically to internal signal source. "Genlock source presence" and "Genlock" indicator lights, plus lighted pushbutton switches facilitate immediate identification of signal source. The Model 312 is rack

mounted, has a 1 3/4" front panel, and is compatible with Sony equipment as well.

For More Details Circle (70) on Reply Card

Audio Signal Delay

An all electronic audio signal delay unit, the **Quad-Eight TM 499 Time Machine** has many new features and has a new standard of specifications. With a single audio input, up to 499 milliseconds of 12 bit quantized audio delay may be routed into a maximum of five outputs.

A modular package, the TM 499 has these exclusive features:

12 bit digital encoding, resulting in lowest distortion and broadest input dynamic range is combined with a complementary pre and de-emphasis control, automatic muting function, and an integral compressor.

Typical Specifications: Frequency Response, 20 Hz to 16 kHz \pm 1.0 dB; Dynamic Range, 82 dB; Distortion, less than 0.2%; Output Noise, less than -90 dBm.

Designed to rack mount in 5 1/4 inches of vertical space, the totally self-powered mainframe is a complete assembly which permits simple and trouble-free operational set-up.

For More Details Circle (71) on Reply Card

Exhibitors Use Student Helpers

Re-reading your fine NAB coverage, I just saw a caption on page 22 (May) in which you observe that Cohu "has found a unique approach to exhibits..." using college students as cameramen.

I admire the fact that Cohu did this in Houston, but you should know that we produced our big, multi-camera Norelco shows at NAB for years with local students.

We invariably gave them prominent plugs in our voice-over, our pitch being that it spoke well not only of them and their schools that they did such great jobs after one day of rehearsal, but it also said much about the cameras.

We used as many as seven students per show, and last year in Washington had two girls and four boys from American University, (see photo). In Chicago, the students at Columbia College liked to work our NAB productions so much that in



mid-year we'd start getting letters from them saying, "Next year, tell the Prof. (TV Dept. Chairman H. Thaine Lyman) to pick me for your Norelco show!"

Anyway, good for Cohu for giving these sharp, young TV-professionals-to-be the breaks.

**John P. Maloney, Mgr.
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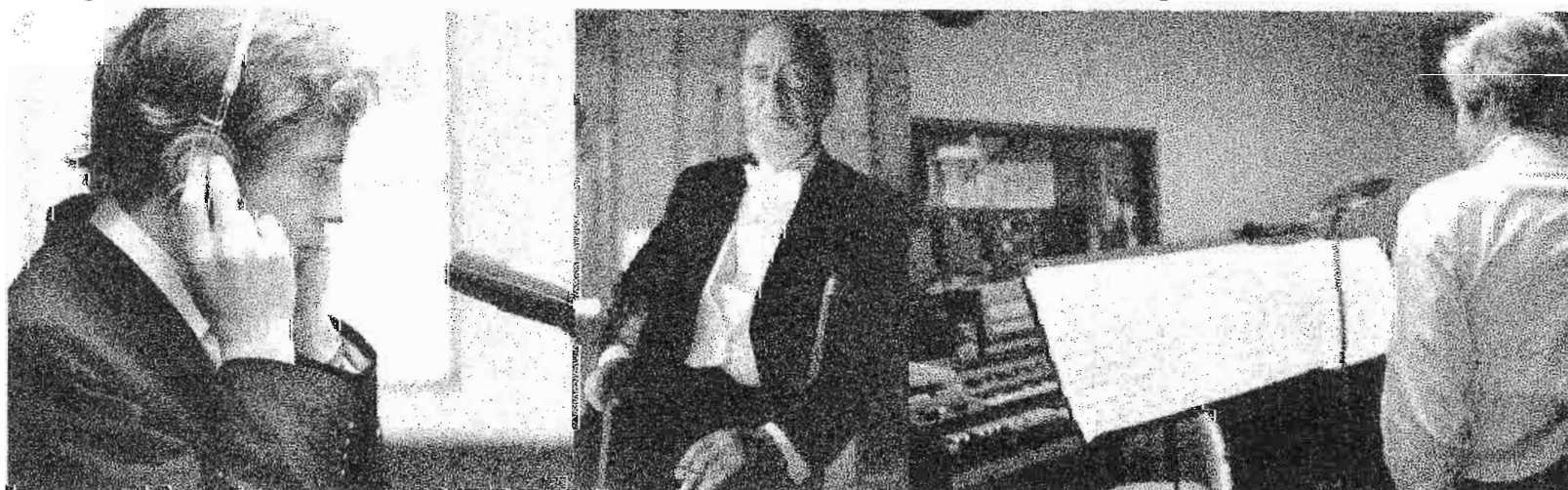
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