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1974 automation report

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In March, NEC introduced the frame synchronizer to U. S. broadcasters. Because the frame synchronizer is a completely new kind of product, it took a little time to find out what its real capabilities are. Since NAB, all four networks have had the unit in their studios for evaluation — the consensus of opinion is that the frame synchronizer is the most revolutionary broadcast product to come along in years.

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July, 1974

July, 1974 • Volume 16, No. 7

BROADCAST engineering

The technical journal of the broadcast-communications industry

in this issue...

About The Cover

The automated station and where it stands today is the theme of this issue. Photo courtesy of Gates Division, Harris-Intertype Corp.

Departments

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DIRECT CURRENT FROM D. C.

July, 1974

by Howard T. Head

More On Campus "Carrier-Current" Stations

Few items in this column in the past ten years have attracted as much attention as the mention in the April issue of campus "carrier-current" operation. We have had so many calls and letters that rather than attempt to answer each individually, we will give a more complete explanation here.

"Carrier-current" stations are not licensed by the Federal Communications Commission. The typical operation feeds RF power at a frequency in the 540-1600 kHz band into the AC power line, providing reception primarily in the region sufficiently close to the power line where the RF field may be considered to be an "induction" field. This type of operation is sanctioned by Part 15 of the Commission's Rules, if the signal distribution is primarily by "induction" rather than by "radiation", and Part 15 does not require such a station to be licensed so long as the field strength within 100 feet of the power line does not exceed 24,000/F(kHz).

This is the usual method of operation. Alternatively, however, the Commission"s Rules provide for operation of this type so long as the DC input to the RF amplifier does not exceed 100 milliwatts, and the total length of the transmission line plus the antenna does not exceed ten feet. It should be noted that operation under either of these provisions is permissible only so long as no interference is caused to regular broadcast reception.

It was an operation of this latter type (i.e., the 100 milliwatt type) which led to the problem described in the April column. A station operator had asked that the power limit be raised for his operation from 100 milliwatts to 6 Watts and the Commission turned him down. At about the same time, the Commission also shut down a clearly illegal operation in the FM band in the Washington, D.C. area, where a power of about 8 Watts was being employed, but this had no relation to a campus "carrier-current" station.

The fact that "carrier-current" operations are not licensed has often raised serious questions at the Commission. For example, to what extent does the Fairness Doctrine apply to these stations? and may they accept cigarette advertising which is forbidden to commercial radio stations? and what about obscenity? The Commission can't revoke their licenses because they have none. Yet these stations are sometimes carried on cable systems, which are subject to FCC regulation and all of the structures which apply to broadcast stations.

On top of all this is the unresolved question, partly engineering and partly legal, as to whether the Federal Government has any real jurisdiction over the magnitude (and program content) of the

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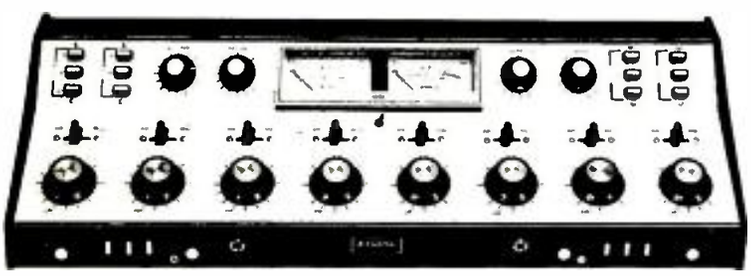

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signals which are laid down to consenting adults on private property so long as "outsiders" are not affected. For the time being, the Commission has adopted a "hands-off" policy so long as there are no complaints of interference to regular reception.

More On Carrier-Current Operation

Quite apart from campus operations, the Commission is endeavoring to cope with a rapidly-growing demand from the highway authorities for methods of informing the motoring public of highway problems and traffic conditions. We have reported in previous issues of the magazine on experiments with carrier-current operation to provide traffic information in the vicinity of the approach routes to Los Angeles International Airport. These signals are now carried at 535 kHz, just below the regular broadcast band, and we can attest from personal experience to the utility of the messages transmitted.

Interest has also been expressed by Federal and State Highway authorities in methods for transmitting information near confusing interchanges on the Interstate Highway System, and by the U.S. Park Service in a means of acquainting visitors to increasingly congeted National Parks with traffic problems, as well as subjects of general interest to the visitors. Frequencies used must be either in or immediately adjacent to the 540-1600 kHz band so as to permit their reception on AM car receivers. There appear to be good prospects of clearing both the band at 535 kHz, as was done in the Los Angeles area, and the band immediately above 1600 kHz, which is now assigned for remote broadcast pickup use but little used, for these purposes.

Re-Regulation Extended To Include CATV

The Commission has extended the scope of the activities of its Re-regulation Task Force, previously limited to the rules governing AM and FM Radio, to include Cable TV. A new Task Force has been established in the Commission's Cable Bureau to review each of the Cable TV Rules and Forms looking toward eliminating unnecessary regulations, procedures, and paper work. Particular attention is being directed toward relief for the small cable system operator.

As in the case of the broadcast reregulation study, the Commission has simplified the procedure for persons wishing to express views or provide the Commission with suggestions. All that is needed is a simple letter to the Commission pointing out the problem and addressed to Cable Reregulation Task Force, Cable TV Bureau, FCC, Washington, D.C. 20554. This can even be done by telephone, by calling (202) 632-6468.

Short Circuits

A master antenna television system in Washington State has been ordered to correct interference resulting from the generation and re-transmission of the second harmonic of an educational FM signal which fell within the passband of a television station carried on the system...The Commission has simplified its rules so as to drop the requirement for Commission certification of the posting statement required by commercial radio operators working at a radio station but required to post their license elsewhere.

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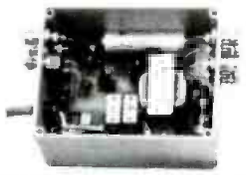

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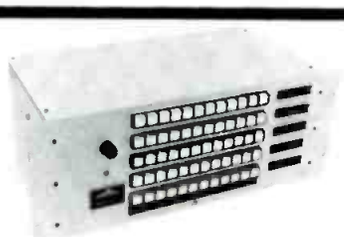

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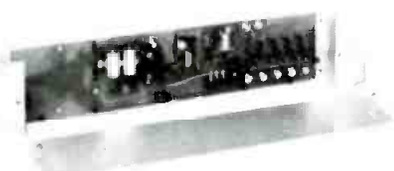

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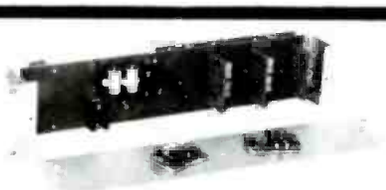

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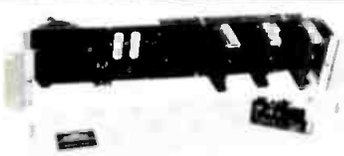

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INDUSTRY NEWS

Thank You, Mr. Sinclair

A check for $100,000, representing royalties from one recording of Canadian broadcaster Gordon Sinclair's editorial, "Americans," was presented to the American Red Cross last month at the closing session of the organization's national convention in Minneapolis, Minn.

Byron MacGregor, news director of radio station CKLW, in Windsor, Ontario, Canada made the presentation on behalf of himself, CKLW and Westbound-Eastbound Records, which produced MacGregor's recorded version of the editorial.

Sinclair, who also made a recording of the editorial, on the AVCO label, was on hand for the presentation, following which both he and MacGregor were honored by Red Cross chairman Frank Stanton.

It was over a year ago, on June 5, 1973, that Dr. Stanton told delegates at the national convention in New Orleans that the organization's disaster reserve fund had been exhausted by a continuing series of tornadoes, floods and other catastrophes. Later that day, a wire service story mentioning Dr. Stanton's remarks inspired Sinclair to write his now-famous editorial.

Others honored at the presentation were Donald Hartford, president and general manager of CFRB, Toronto; Gordon Ashworth, vice chairman of the board, Baton Broadcasting, Inc., Windsor; Herbert McCord, president, CKLW, Windsor; Armen Boladian, president, Westbound-Eastbound Records, Inc., and Bud Katzel, general manager, AVCO Reocrds Corporation.

Bud Katzel, (center) general manager of AVCO Records Corporation is shown here presenting a special plaque to Gordon Sinclair, (left) author of the famous editorial, "Americans," which Mr. Sinclair and others have recorded. Observing the presentation, which took place during the American Red Cross national convention in Minneapolis last week, is ARC chairman Frank Stanton.

Portable TV Center Introduced

Another first in quality education is a portable television control center developed by the Harrisburg School District, Harrisburg, Pennsylvania. All equipment except for the television cameras is hard mounted in a Wells Cargo UT-8 trailer. The director sits in the trailer during production and controls the program from there. When they pull up to a program site they only have to unhook the wall mounted cameras and set them outside and plug into a power source. They are able to produce programs of high quality, usable on mass distribution cable systems. The whole unit is student operated. The UT-8 trailer is manufactured by Wells Cargo, Inc., of Elkhart, Indiana.

Modular Audio Joins Industry

Modular Devices, Inc., a rapidly growing manufacturer of operational amplifiers, audio amplifiers, and special military products has formed a new unit - Modular Audio Products, Inc., announced Julius Brick, President of the parent company and the new subsidiary. Brick also announced that Martin Gittleman, formerly of Automated Processes has joined the new company as Vice President-Chief Engineer.

The new unit will expand and further develop the existing product line of Modular Devices in the professional audio field. This engineering oriented company will provide a new focus and fresh broad line of components for consoles and sound systems applications. Initial product line will include amplifier modules, equalizers, compressors, peak limiters, switching and control modules, and accessories.

Modular Audio Products will be located at the same facility as its parent company at Airport International Plaza, a modern industrial complex adjacent to MacArthur Airport.

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

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.

York-Harrisburg-Lancaster, Pa.	Charles Morgan, WARM, Avoca, Pa., (717) 346-4646.
San Francisco	Robert Dainer, CBS Labs, 1 Embarcadero Ctr., S. Francisco
Long Beach, Cal.	Merton Garlick, 3758 California Avenue, Long Beach, Cal.
Petersburg, Pa.	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, Textronix, 3828 Lawrence Rd., Quincy.
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.

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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 Benjamin Wolfe who has served a number of terms on the SBE Board of Directors. It is significant that Mr. Wolfe was awarded the grade of Fellow by Unanimous action of the board of directors at their meeting preceding the annual meeting on March 17th, 1974 in Houston, Texas.

SBE Fellow Benjamin Wolfe

Benjamin Wolfe, a native of Baltimore, is a broadcast pioneer and has been engaged in communications since the early 1930's. He is

presently Vice President, Engineering, Broadcast House, WTOP, Washington, D.C. During World War II, he served as a technical supervisor in the Radar Group of the U.S. War Department, and following the war was an engineer for the Federal Communications Commission. He was associated with area broadcast stations from 1946 to 1949. From 1949 to 1962 he was Chief Engineer of WJZ-TV, Baltimore, and from 1962 to 1964, was Chief Engineer of KPIX, San Francisco, both Group W Stations. From 1964 to 1969 he was Vice President of Engineering for Westinghouse Broadcasting Corporation in New York City. In 1969 he was appointed Vice President for Engineering of Post-Newsweek Stations, Inc. whose stations include WTOP Radio and WTOP Television, Washington, D.C., WPLG Television, Miami, Florida; WJXT Television, Jacksonville, Florida, and WCKY Radio, Cincinnati, Ohio.

He holds United States Patents in "Multi-Channel Communications Systems with Anti-Acoustic Feedback" and "Single Carrier Television-Multiplexed," and is the author of many engineering articles. He pioneered the development of the first three-antenna candelabra tower in the world, now used in Baltimore. More recently he is credited with the conceptual design

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MICROWAVE ASSOCIATES

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and specifications of a new type of television transmitter, developed and manufactured by The Radio Corporation of America.

Ben Wolfe is a senior member of the Institute of Electronic and Electrical Engineers and is a member of the Society of Motion Picture and Television Engineers. An associate member of the Association of Federal Communication Consulting Engineers and presently is serving as Chairman of the NAB Engineering Committee. In 1971 he was the recipient of the NAB Engineering Award for his technical contributions to the broadcasting industry. He is past Chairman of the Baltimore Section of the Institute of Radio Engineers.

Mr. Wolfe is a Charter Member of the Society of Broadcast Engineers, having played vital roles in its early formation and its progress ever since. He was elected to the grade of Fellow by action and unanimous vote of the SBE Board of Directors on March 17, 1974.

Let's Keep In Touch

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.

The deadline for submitting copy to the SBE Editor is the 25th of the second month preceding publication. For example, the date by when copy must be in the hands of the SBE editor for the September 1974 issue is July 25th; and for publication in the October 1974 issue, the deadline is August 25th, and so on.

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

Note to Manufacturers

You'll note from time to time that various SBE chapters are considering the possibility of having a MiniVention. This has been a successful project so far, so if you want to get in on the action, contact the chairman of the chapter in your area. Their names and stations are listed at the beginning of each chapter report.

Chapter Reports

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

The chapter was the host at the annual 3-chapter Joint Meeting, held May 14th at the Owego Treadway Inn, Owego, N.Y. Chairman Colborn's hard work paid off in good attendance. The guest speaker, Sidney Arak, Communications Attorney for Finklestein and Firestone, Washington, D.C., provided an interesting review of the legal aspects of the broadcast industry. A substantial number of members and guests travelled from both the Syracuse and the Scranton/Wilkes Barre areas to attend. It was announced that the three chapters would again sponsor the MiniVention; the date is set for October 11, 1974, again at the Owego Treadway Inn, the same location as for last years successful initial event. Further information is available from Larry Taylor, WENY, Elmira, N.Y.

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

On April 25th, the chapter held a business meeting followed by a general discussion on the upcoming Ladies Night, May 11th, and the Joint Meeting with Chapter 1 and 22 in Owego, N.Y. on May 14th.

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

The April 17th meeting was held at Shakey's Pizza Parlor. It was a rehash of the NAB Convention, hosted by Dalis Electronics and represented by Ed Loya. Aside from the new officers, as listed in the previous issue, additions are Member-at-Large Chuck Deen, Roger Johnson, Bulletin Editor, and Al Hillstrom, Chairman, Membership Committee. Also, Hillstrom and Chuck Deen were appointed in charge of the annual Christmas party.

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

On Thursday, May 9th, 6 PM dinner in the **New York Times** Cafeteria preceded the technical session at 7:30 PM in the WQXR Presentation Theater in the same building, 229 West 43rd St., 9th Floor, Don Richardson, Manager, Transmitter Division, American Electronic Laboratories spoke on Transmitter Installation and

Maintenance. He was assisted by David Bain, local representative for AEL. Art Silver, chapter program chairman announced that the June meeting will feature Tom Silliman, director of research, Electronics Research, Inc., who will speak on practical aspects of FM propagation. Then, in July, Art Silver himself, who is also associated with Gates Division of Harris Intertype, will talk on the new Gates MW-5 Transmitter, a pulse-duration modulation type. Guests are always welcome.

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

The chapter met on Wednesday, May 8th, at the Norselander Restaurant to hear Harry and Mary Lewis discuss the communications field in Spokane's EXPO '74. Bob Adams and Bill Pickering were appointed to the nominating committee for Fellows nominations. Incoming officers expressed thanks to John Maxson, Lew Rambo, and Bill Pickering for their excellent work in making the chapter a successful unit. Newly elected are Chairman Harry Lewis of N.S.C.C.; Vice Chairman Bob Robinson, KSTW-TV, and Secretary-Treasurer Walter Scott, KTVW-TV. Nick Foster will continue as editor of the chapter newsletter.

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

The main topic of the May 30th meeting, held at Buddies, Upstairs, 439 Market St., following a 12-noon luncheon, was to discuss the possibility of sponsoring a MiniVention. Larry Taylor, who had spearheaded a similar successful event in cooperation with Chapter 1, 2 and 22, in October, 1973, in Owego, N.Y., was the guest speaker. He reviewed the sequence of events leading up to the MiniVention and provided a number of recommendations on helping to assure the success of a Pittsburgh MiniVention.

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

The May meeting was held jointly with Chapters 1 and 2 at the Owego Treadway Inn, Owego, N.Y. As usual, the membership from Chapter 22 was well represented and enjoyed the program by communications attorney Sidney Arak of Finklestein and Firestone, Washington, D.C. A buffet dinner preceded the meeting.

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

The April 25th meeting was held at WFLD Studios. Steps were taken to enlarge the mailing list for meeting notices. A fine series of programs is lined up for the summer months. The size of the chapter continues to grow. The technical session featured Bob Seaburg, Tektronix field engineer, who presented a program on the VIR signal especially its use in controlling picture quality. A complete VIR system was set up and demonstrated. A tour of WFLD studios was provided later.

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

On May 28th the monthly meeting was held at Radio City Auditorium, WTMJ, Inc., where C. A. Gustafson, vice president, Hutmacher and Associates, spoke on MATV and CATV systems. "Gus" described the Jerrold line of MATV/CATV products and their applications and later responded to a number of questions from the floor. Jim Sorensen, WRJN, and

chairman of the chapter Nominating Committee announced the committee's recommendations as follows: Chairman, Bob Truscott, chief engineer of WITI-TV6; Vice Chairman, Dave Dzurick, chief engineer of WRJN, Racine; Secretary-Treasurer, Jan Pritzl, engineer at WMVS/WMVT.

Chapter 32: Southern Ariz. Chairman: Hobart J. Paine, Tucson, Ariz. 85717

The chapter met on April 25th at KUAT-TV, University of Arizona to hear Bill Montgomery of Tektronix discuss and demonstrate the Tektronix 1440 Video Corrector which is the vertical interval reference signal controlled video processing amplifier. A videotape on this device was also shown. Montgomery also offered members the opportunity to copy 4 cassette videotapes on the following topics: Linear Distortion; Non-Linear Distortion; Signal Noise Measurements; and Field Time/VIR. Informal reports and comments were provided by a number of members on what they experienced at the recent NAB convention in Houston. Chairman Paine commented on the many new and relatively inexpensive TBC's and Sync Gen's he saw. Jim Kluze, KZAZ, and Rich Heatley suggested that the SBE should consider maintaining a library of technical video tapes for loan to chapters, or at least maintain a listing of what is available and from where. Paine also reported on a newsletter/journal presently under consideration.

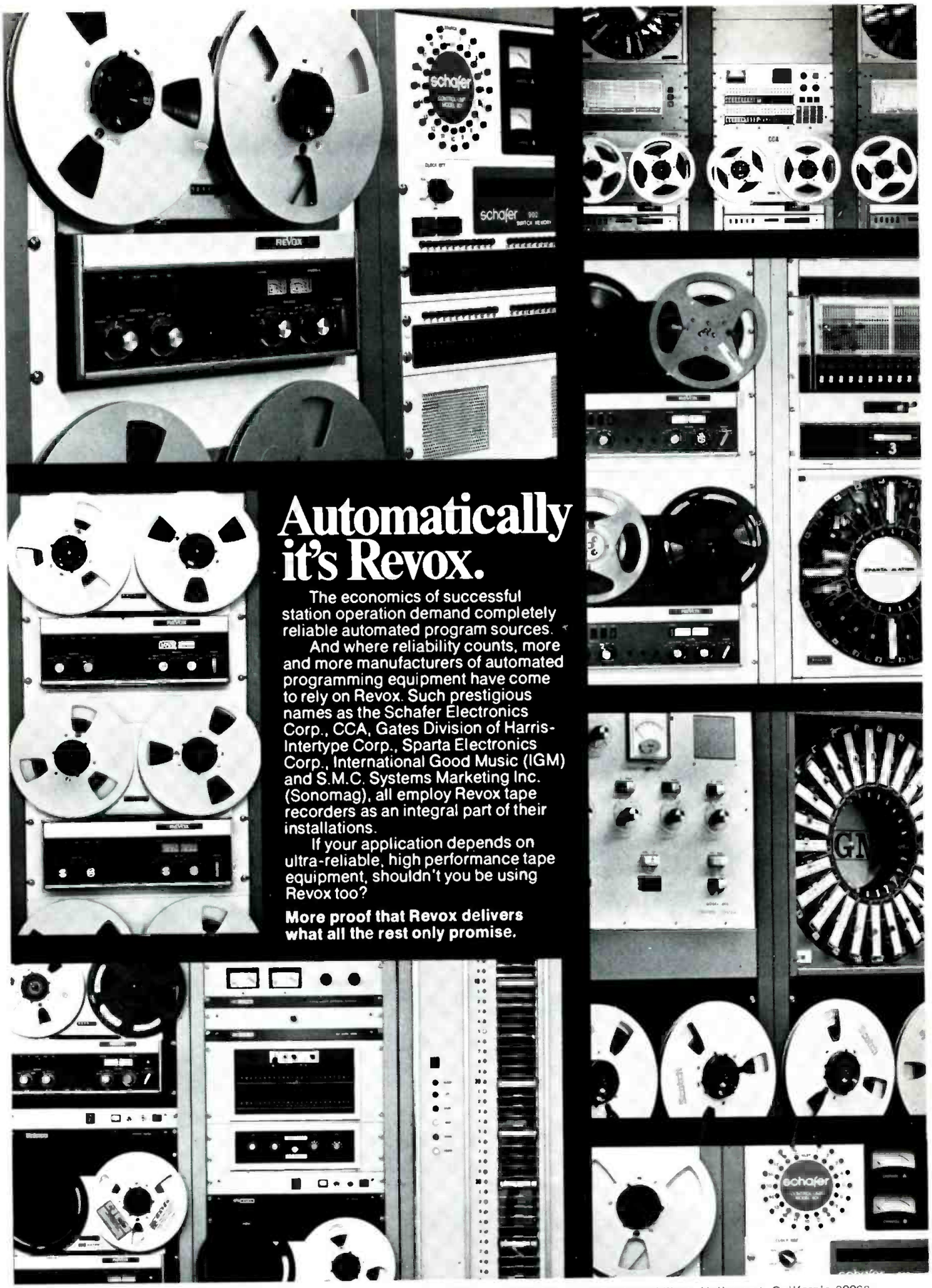
The May 22nd meeting of the chapter was held at KGUN-TV, where program director Gene Stough arranged for Ron Benson of Zonar Corporation to demonstrate the CVS Time Base Corrector and the JVC Portable Color Camera. Chairman Bart Paine urged members to write articles for publication, emphasizing that professional literary ability is not a prerequisite. The main need is for ideas, problems that have been solved, operating techniques, and so on.

Louisville, Ky., Prov. Chapter Chairman pro tem: Paul Kelly, WLKY, Louisville, Ky.

The April 16th meeting at WKPC Studio included a brief business meeting followed by a technical program provided by Telemet. Bill Robinson introduced Alex Kivartnovv, Telemet Director of Engineering who discussed the need for a precision demodulator in the modern television studio and transmitter system. The use of a sideband analyzer was demonstrated. The May 14th meeting was held at Galt House Belevedere where John Ball of PBS described the operation of a television satellite station. The June meeting would be held in Lexington Ky., it was announced.

Albuq. N. Mexico Provisional Chapter Chairman pro tem: Guy Smith KRZY/KRST Albuq., N. Mex.

The chapter organized in January, 1974 with temporary officers as follows: Chairman, Guy Smith; Vice Chairman, F. A. Bibeau; Secretary-Treasurer, Mike Langer. At the April 6th meeting, held at the Airport Marina Hotel, Guy Smith spoke on the advantages of membership and the aims of the New Mexico chapter. The guest speaker, Vir N. James, a consulting engineer, a charter member of the SBE, and a national director of the Society, talked on the history and current projects of the SBE. The temporary officers were elected by acclamation to a one year term. Miss Ann Mize was nominated and elected to the office of recording secretary. R. V. Martinelli was nominated and elected publicity chairman. A discussion on plans for future meetings followed.



Automatically it's Revox.

The economics of successful station operation demand completely reliable automated program sources.

And where reliability counts, more and more manufacturers of automated programming equipment have come to rely on Revox. Such prestigious names as the Schafer Electronics Corp., CCA, Gates Division of Harris-Intertype Corp., Sparta Electronics Corp., International Good Music (IGM) and S.M.C. Systems Marketing Inc. (Sonomag), all employ Revox tape recorders as an integral part of their installations.

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For other countries: Revox International, Regensdorf 8105 ZH Althardstrasse 146, Switzerland.

1974 automation report

By Ron Merrell

Whenever the subject of broadcast automation comes up for discussion, there usually is a certain amount of confusion that prevails. Perhaps that's true because we have varying definitions of just what automation really is. But wait, isn't automation wall-to-wall and wall-to-ceiling rack arrangements of carousels and reel-to-reel tape machines?

Certainly, that's part of what we generally think of when we talk about automation. Yet it doesn't necessarily begin or end there.

Originally, of course, we laid the term down on anything automatically controlling or assisting programming. In that context, simplistic automation could mean that one "automatic" turntable could automate our programming. An extension would be to tie two turntables together so that they would play as many as eight or ten consecutive records. Over simplified? Not really.

From this low key approach we can jump to cart machines that play in a sequence. And from there to multiple deck machines. Once in that train of thought, you can follow the vertical trough random select moveable head assembly. Or, you could jump to the cylindrical carousel format and on to the video cart machines.

But when we back up to the sequenced cart machines or the multiple deck and random select machines, we find the owners seldom think of their programming as automated. And that probably comes from thinking that automation also means "all hands off".

So programming is emphasized when automation is the topic of discussion. But it needn't be.

There are all kinds of automatic assistance circuits, and there are many functions typical of broadcast stations that can be automated. In fact, a station could be very heavy in automation and have its programming handled in the old, traditional format.

How? By integrating systems that automatically track and record the vital station equipment parameters. By computers that (leased, shared or owned) instantaneously read out time spot availabilities or handle accounting and billing functions, or satisfy traffic demands.

Technically, automation can invade nearly every operation of the broadcast station, be it AM, FM, or TV. Even the logging task can be accomplished automatically.

If we took the term in its strictest sense, we would have to conclude that most stations are partially automated and perhaps only a handful are totally automated.

It was just a few years ago that automation in the broadcast station became a lively topic. In fact, at the outset there were notions that almost every station would some day be automated. Of course, the term was being taken to mean automated programming.

Obviously, the landslide didn't come. However, the movement was sufficient enough to keep owners thinking about functions that could be simplified by automation. They, too, began to discover that there was far more to automation than just program control....even though that aspect even today is the automation headliner.

In 1971, **Broadcast Engineering** magazine surveyed the broadcast industry to see to what extent automation had been superimposed upon station operations. And we also asked the industry what was going right, wrong, why, and to indicate what it then considered prime areas for future automated operations.

Since 1971, the national economic picture has not been all that

1971 Over-The-Air Automation Report

	Automation Status			Emphasis	Engineering Staff		Problem
	% Now	% Will	% Will not	Is On	% Increase	% Decrease	Areas
AM Top 100	33%	55%	45%	Equip. Control Programming Accounting	10%	24%	System Capabilities Equipment
AM Below Top 100	20%	40%	60%	Programming	0%	0%	Personnel
FM Top 100	57%	56%	44%	Programming Equip. Control	4%	4%	Personnel
FM Below Top 100	60%	52%	48%	Programming Equip. Control	4%	0%	Personnel
TV Top 100	46%	63%	37%	Equip. Control Accounting Sales	8%	23%	Inputs Personnel Format
TV Below Top 100	15%	48%	52%	Equip. Control Accounting	5%	0%	Inputs Personnel

1974 Over-The-Air Automation Report

	% Now	Of Those Not Automated % Will	% Will Not	Emphasis Is On	Engineering Staff % Decrease	% Increase	Problem Areas
AM-FM Top 100	62%	22%	78%	Programming Equip. Control Monitoring Accounting	18%	10%	Personnel
AM-FM Below Top 100	50%	41%	59%	Programming Equip. Control Time Keeping	0%	0%	Personnel
TV-Radio Top 100	69%	60%	40%	Equip. Control Accounting Monitoring Operations Log	8%	2%	Personnel Changing Formats Inputs Maintenance
TV-Radio Below Top 100	40%	30%	70%	Monitoring Operations Log Accounting	11%	9%	Inputs Personnel Capability Maintenance
AM Top 100	35%	40%	60%	Equip. Control Programming Accounting	18%	12%	Changing Format Equipment Capability
AM Below Top 100	34%	30%	70%	Programming Time Keeping Accounting	0%	6%	Personnel Maintenance
FM Top 100	60%	40%	60%	Programming Equip. Control Operations Log Monitoring	0%	5%	System Capability
FM Below Top 100	64%	48%	52%	Programming Equip. Control Time Keeping	0%	5%	Personnel Maintenance
TV Top 100	50%	35%	65%	Accounting Availabilities Traffic Operations Log Equip. Control	24%	2%	Personnel Changing Format Inputs
TV Below Top 100	43%	59%	41%	Accounting Monitoring Equip. Control Availabilities	20%	0%	Inputs Personnel Changing Format

Fig. 1 Combination stations have been added to this year's survey. In the will or will not automate columns, these numbers represent those stations not presently automated, but they do not tell how far the station will go with automation. The numbers in the staff increase-decrease columns represents only the percentage of stations with changes, not the percentage of people added or dropped.

bright. And that has a bearing on the automation invasion. While it was possible to save money with this approach, it also meant capital investment. So, while there are some limiting factors to the fulfillment of the total automation concept, broadcast economics probably has been the most consistent one.

For the sake of perspective, let's take a look at where we were three years ago and where our 1974 survey tells us we are today. And keep in mind that today there are 125 more AM's, 200 more FM's, 220 more educational FM's, and 51 more TV's on the air.

As the survey indicated in 1971, the major problem involved with automation at the station is the operating personnel. We expected this in 1971, not in 1974. Unfortunately, the incidence of problems associated with operating personnel is reported by a significant number of stations. This does not mean that these people are not capable, in most cases. What it does mean is that too many are not being properly indoctrinated, and even if they are, they do not understand the system. Button punching is one thing, understanding the consequences is something else.

Other problem areas include system capabilities and changing formats. Actually, the two can be the same problem. Before the plunge into automation is signed and sealed, the major effort by management and engineering should be to pinpoint station needs. Equally important are projected needs and how the system will fit into format changes.

The problem areas, then, are usually station oriented. Few stations report maintenance problems. And when maintenance is a problem, it comes most often in replacement parts availabilities. That's a

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problem that plagues a number of industries.

While the question wasn't asked in the survey, we have found that some stations are surprised to find that they spend a considerable amount of time dubbing to carts and maintaining a cart library. In fact, in some cases, going to automated programming has meant refurbishing and equipping the recording booth. A given format that could save time at the board is offset by time invested in production. You've got to feed the machinery.

As you can see in the survey results, and as we indicated at the beginning of this article, other station operations are heading into automation. Just how much emphasis is placed on each operation depends on the type of station in question and the market it serves.

While FM is gaining momentum, you'll note that they are not making use of automation for accounting and sales/availabilities. As the ad volume picks up in FM, this will change. But as it stands now, manufacturers will have to put this one aside as a future market.

The most pressing need for accounting assistance shows up in television, despite the market size. A few manufacturers offer equipment that can handle the load, but some managers are opting for outside computer sharing services. Either way, the benefits of automated assistance here are very real and necessary.

The RCA and Ampex video cart machines have done their share to untangle the jumble of spots to ID's to program. And now RCA is offering a film cart player. Then too, the big broadcast quality VTR's lend themselves to automation. If it weren't for the new trend in video tape electronic journalism, the TV complex might be affected from stem to stern....depending on how you edit.

From the maintenance side of TV automation, the majority of the grunt work is being shared by company field engineers and station engineers serving in the top 100 markets. But below the top 100, station engineers do most of the automation maintenance work. Supplier assistance in the top 100 level is devoted largely to program assistance machinery.

Prime Interest Areas

Of course we wanted to know what operations would be in for the automation treatment in the near future. (This will help clarify what is meant by the "will" automate column of Figure 1.)

In the lists that follow, only those categories receiving significant responses are listed, and they also are listed so you can see the descending order of importance to the stations.

AM Stations
1. Programming
2. Equipment Control
3. Traffic
4. Operations Log

AM-FM Stations
1. Programming
2. Operations Log

FM Stations
1. Programming

TV Stations
1. Equipment Control
2. Operations Log
3. Sales Availabilities
4. Accounting
5. Traffic
6. Equipment Control

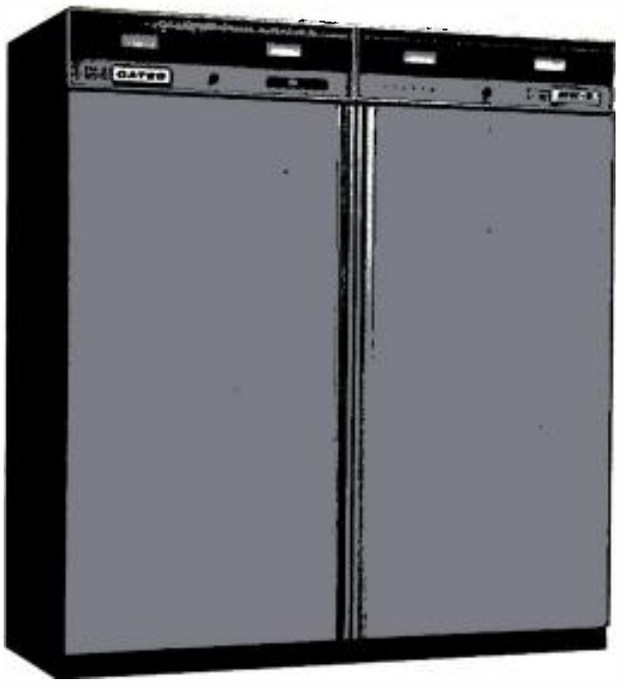
TV-Radio
1. Equipment Control
2. Sales Availabilities
3. Operations Log
4. Accounting
5. Programming

The highest interest reported was in equipment control for TV stations, and the same held true for TV-Radio combination stations.

Summing Up

Take it from those who've tried it or are committed to it, understanding the machinery and how it melds or collides with the program format are key points. Add these points to

(Continued on page 59)



Harris/Gates new 5kW AM has PDM* going for it.

Harris/Gates new MW-5 transmitter needs only two tubes for 5,000 watts—provides 125% positive peak modulation capability for a louder sound—has overall transmitter efficiency exceeding 52% for lower operating cost. All this possible because of Harris/Gates patented Pulse Duration Modulator* (PDM) field proven in the top-selling 50,000 watt MW-50 transmitter. For complete information, write Harris Corporation, Gates Broadcast Equipment Division, Quincy, Illinois 62301.

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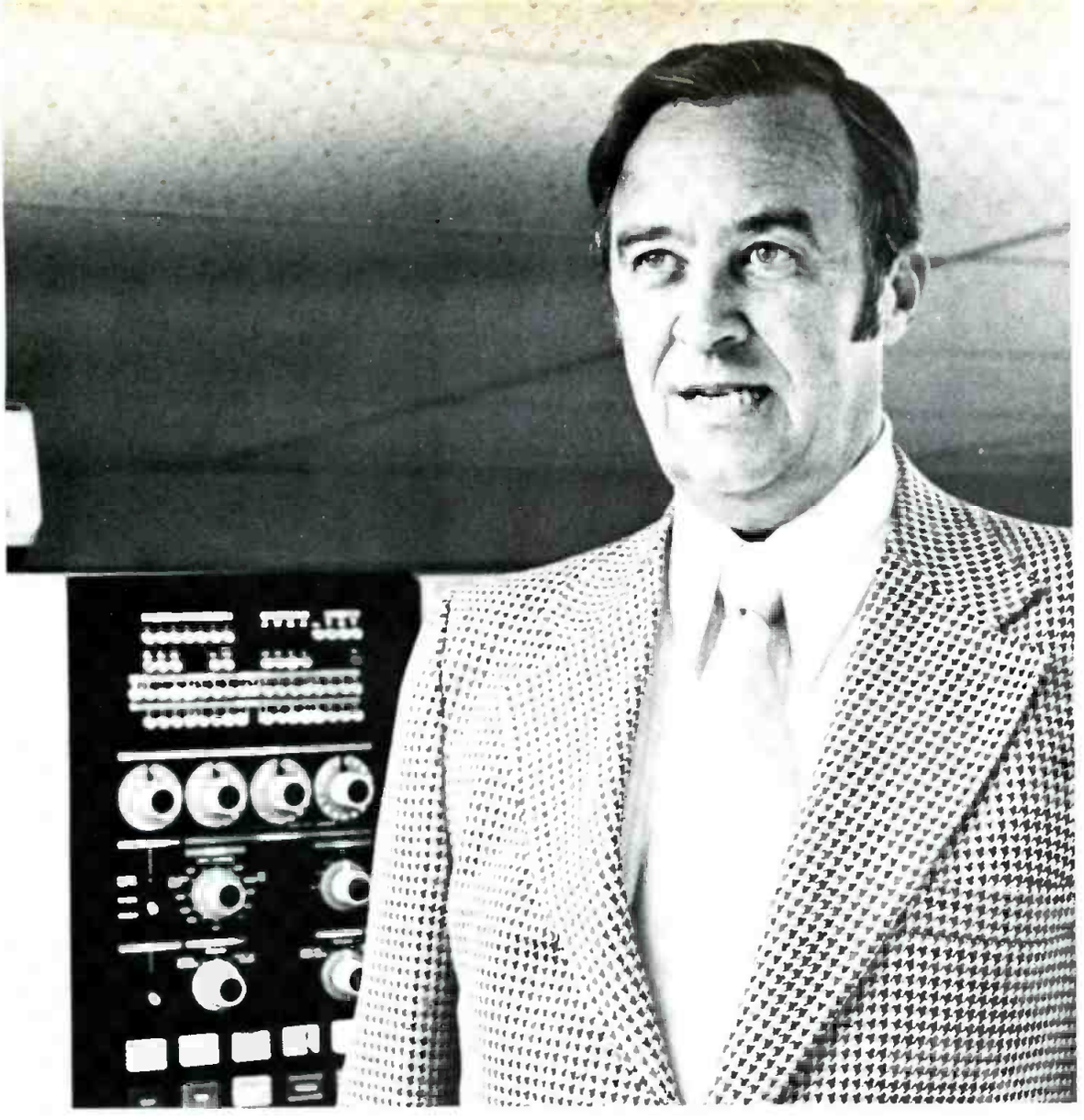


Computer-based automation will be almost mandatory in the upcoming competitive situation, according to the author, Ray Butterfield, executive vice president and general manager, WLOX Broadcasting Co., Biloxi, Miss. Later this year, the station will "marry" the System/7 to a System/3, a general-purpose computer, to automate operations from the time an order is written, through customer billing.

Automation aids WLOX recovery

By Ray Butterfield
Exec. VP and GM of WLOX, Biloxi, Miss.

At WLOX-TV, we have one of the first computer-based remote control operations to be approved by the FCC. We're using a small computer—an IBM System/7—to monitor and control our transmitter, thirty miles away. And we're getting far better control, with fewer headaches at lower cost than before.

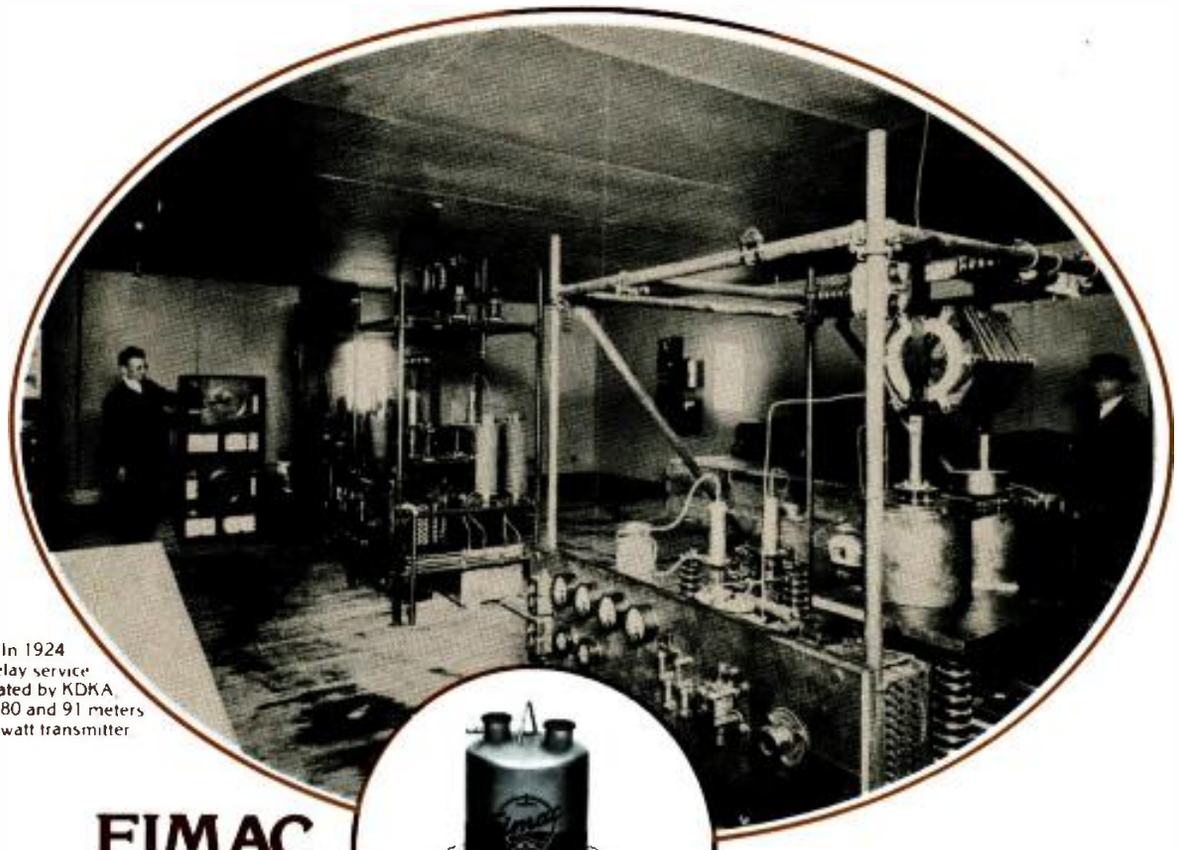
WLOX-TV is the 178th market in the country. Far from being "too small" to automate, we feel that our size makes automation particularly attractive. With the larger New Orleans and Mobile markets nearby, competition is severe for good personnel. We can't afford to hire as many good people as the larger markets, but we can and do pay well for those we do hire. Now, automation enables us to use their talents to the fullest, and this alone pays for the System/7. In addition, we can now make the best use of the studio and equipment. As a result, we provide a better product and can expand without adding personnel.

WLOX Broadcasting Co. operates WLOX-TV, an ABC affiliate, on Channel 13, and WLOX, a Class IV, 24-hour AM station, with an authorized daytime power of 1000 Watts and 250 Watts at night. We have 73 employees, about 50 affiliated with WLOX-TV. Studios are in Biloxi; our television transmitter and 1319-foot tower are some 30 miles to the north.

Station Manpower

During the twelve hours a day we are on the network, a single engineer oversees that transmitter with the aid of the System/7; runs the control room, using a semi-automated switching console; and also handles event-switching, using pre-taped breaks that help eliminate human errors.

This frees one control panel and the crew that formerly operated it. We have local programming from 6:45 to 10:30 a.m. Then we can go right into production, still using only the one crew, while the System/7 runs the transmitter. We



In 1924 shortwave relay service was inaugurated by KDKA Pittsburgh, on 80 and 91 meters using this 500 watt transmitter

Today, the EIMAC X-2159 super power tetrode

EIMAC brought broadcasting from where it was to where it is.

50 years of progress in communications. 1924 saw the inception of widespread scheduled broadcasting in the United States and Europe. The first shortwave relay broadcast station was a success. The arc and spark transmitters of the early "twenties" were being eclipsed by the fragile, gassy vacuum tube.

Today, fifty years later, international and domestic broadcasting benefit from EIMAC's pioneer developmental work in vacuum tube technology. EIMAC leadership in high power and microwave devices of all types make possible applications considered impossible a few years ago.

EIMAC's family of high gain tetrodes, including the super power X-2159, are predominant for broadcast service, powering today's transmitters and ready to power tomorrow's super power transmitters.

EIMAC develops, others copy or fade away, as the last 50 years have proven.

Look to EIMAC for dependability and cost-effectiveness in vacuum tubes. EIMAC has the answer **today** for tomorrow's communication requirements.

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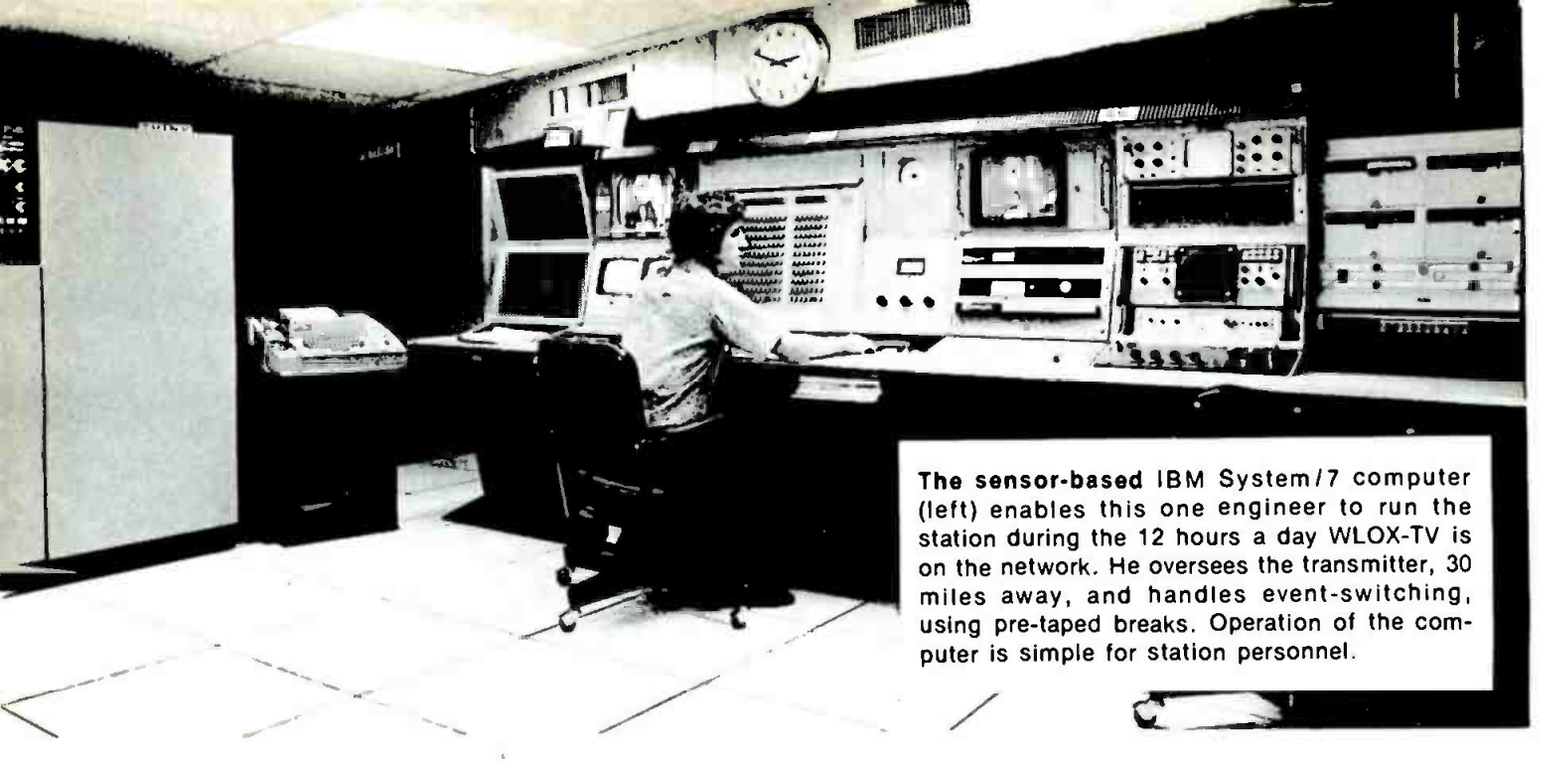


The sensor-based IBM System/7 computer (left) enables this one engineer to run the station during the 12 hours a day WLOX-TV is on the network. He oversees the transmitter, 30 miles away, and handles event-switching, using pre-taped breaks. Operation of the computer is simple for station personnel.

produce a better product at lower cost, because we can bring a talented man into the studio and use him for many purposes, instead of leaving him out at the transmitter adjusting meters.

What's more, we have better control over the transmitter than ever before. Once every fifteen seconds, the computer monitors and controls the primary FCC parameters, such as frequency and power; other critical parameters, such as line voltage—both primary and regulated—and plate volts, plate current and VSWR; and scans building temperature and tower lights during operating hours. (After hours, it checks building temperature and tower lights every minute.)

In all, the System/7 scans some twenty digital and forty analog points at intervals ranging from fifteen seconds to an hour. By contrast, an engineer in a conventional situation generally checks on eight points every half hour. And our system is kept to much closer tolerances now.

Since the FCC requires continuous, positive control, our system includes a fifteen-second timeout device, which is reset by the computer prior to its timeout. A shutdown procedure would start automatically if the System/7 should fail to reset the device within the fifteen seconds. The FCC has accepted this as constituting continuous control.

A teleprinter linked to the System/7 automatically:

- Logs any values that go out of limits;
- Logs when they are brought back within limits—as the FCC requires;
- Prints, every half-hour, the FCC log of aural and visual power, aural and visual VSWR, plate volts and frequency;
- Logs all analog values twice daily;
- Logs aural, visual, and intercarrier frequencies daily;
- Logs any analog value or digital status on operator request;
- Develops a history of daily and monthly averages on all analog points.

In Case Of Trouble

Moreover, if a condition arises that the System/7 can't automatically correct, it alerts the operator by ringing a bell on the teleprinter. The operator can override the system at any point, change limits on input and output points, and execute Emergency Broadcasting System tests.

With our growing understanding of the logs and the adjustments they indicate, we are developing the ability to conduct "predictive" maintenance—possibly the most valuable benefit of all, since it can prevent costly outages. For example, within the first couple of weeks after the System/7 went into operation, we had a tube failure at the transmitter that resulted in an outage of about thirty minutes. Subsequently, **we could see from the logs that the system had been trying to tell us this failure was coming, but we had lacked the experience to recognize it.**

Control of the television transmitter has been so successful that we plan to use the System/7 to control our radio transmitter as well. And soon we will add complete building security monitoring. If any out-of-limit condition arises, the computer will automatically dial the appro-

The teleprinter linked to the System/7 automatically logs any values that go out of limits and the time they are brought back within limits. It prints the FCC log every half-hour.

priate phone number—either the police or an engineer on standby.

Automated Economy

In developing computer-based control of the transmitter, Assistant Chief Engineer and Director of Computer Systems, Jim Fleming, had excellent support from IBM Systems Engineering Services. Together, they saw the opportunity for what we regard as a very substantial advance in the field of broadcasting. This is not an extravagant statement; increased electronic control may well become critical as competition sharpens because of CATV, the possible reduction or loss of gasoline and automobile advertising, and the like. We must achieve every economy we can. And automation allows us to economize while actually upgrading the product we have to offer because we can put talent to work where it's most needed. We can also grow: We are now in a position to go to a 24-hour-a-day operation from the present 18 hours, without adding personnel.

Later this year, we plan to "marry" the System/7 to a System/3 Model 10, a small, general purpose computer. At that time, we will integrate the capabilities of the two computers. The System/3 will prepare the broadcast log and store it on magnetic disk files. We will switch these disks to the System/7 for automatic event-switching. When the System/7 airs a commercial, it will store that fact on disk and produce an aired log, which will meet all FCC requirements. Periodically, the System/7 disk will be placed on the System/3, for fast, accurate billing that will tie in perfectly with the "final Sunday" billing we use as well as with end-of-the-month billing. We will also get automatic credit control and faster, more detailed accounts receivable analysis.

The two computers will be programmed to guard against running two competing commercials within the same fifteen minute segment and will automatically control acceptance of the number of seconds of commercials between network programs, thus preventing oversell and clipping.

We plan to put inventory control of commercial accounts, spare-parts inventory control, and the demographics of our area on the system. Our industry emphasizes the "immediacy of broadcasting" for commercials. Soon, we will be able to respond promptly to all requests for demographic data.

The System/3 will provide us with an analysis, for the FCC, of commercials and public affairs programming, as a percent of commitments. We will receive this daily, so we will always know how we stand.

About The Competitive Future

When we bought our transmitter, in 1964, we got it with remote control features built in, because we saw the potential for remote con-

If a condition arises that the System/7 can't correct automatically, it alerts the operator who can override the computer, by ringing a bell on the teleprinter. Growing understanding of the logs, showing adjustments made by the computer, is enhancing ability of station personnel to conduct predictive maintenance, which will reduce downtime.

Management Highlights

Ray Butterfield joined WLOX as a sports and staff announcer when its radio station signed on back in 1948. Ray was named general manager in 1950, and later he was named executive vice president.

Then back in August of 1969, hurricane Camille devastated the Gulf Coast and destroyed WLOX AM and TV. Your editor talked with Ray and his Chief Engineer - Blue Majure - days after the storm hit. What we found was probably one of the most heroic broadcast stories ever told.

We won't recount all the details here. But it should be remembered that Ray and several members of his staff stayed on the air warning people of the impending disaster. They were in a hotel a half block off the beach. When the giant tidal wave hit, there was every reason to believe that WLOX and their staff had perished. Not so. Miraculously, they survived.

After the storm had passed, all communications were out. It was WLOX, digging out and going back on the air with emergency power that helped save even more lives, because they gave people their only source of information and hope.

It was a soul-searching time, and I put the question to the industry: should you stay, or close your doors and run. It was one of those unforgettable bright spots in our history when WLOX chose to stay. And if you had seen the utter disaster of wrecked equipment that resulted....imagine a waterlogged studio with mud and videotape running every which way....or a baby grand on its side in a closet!

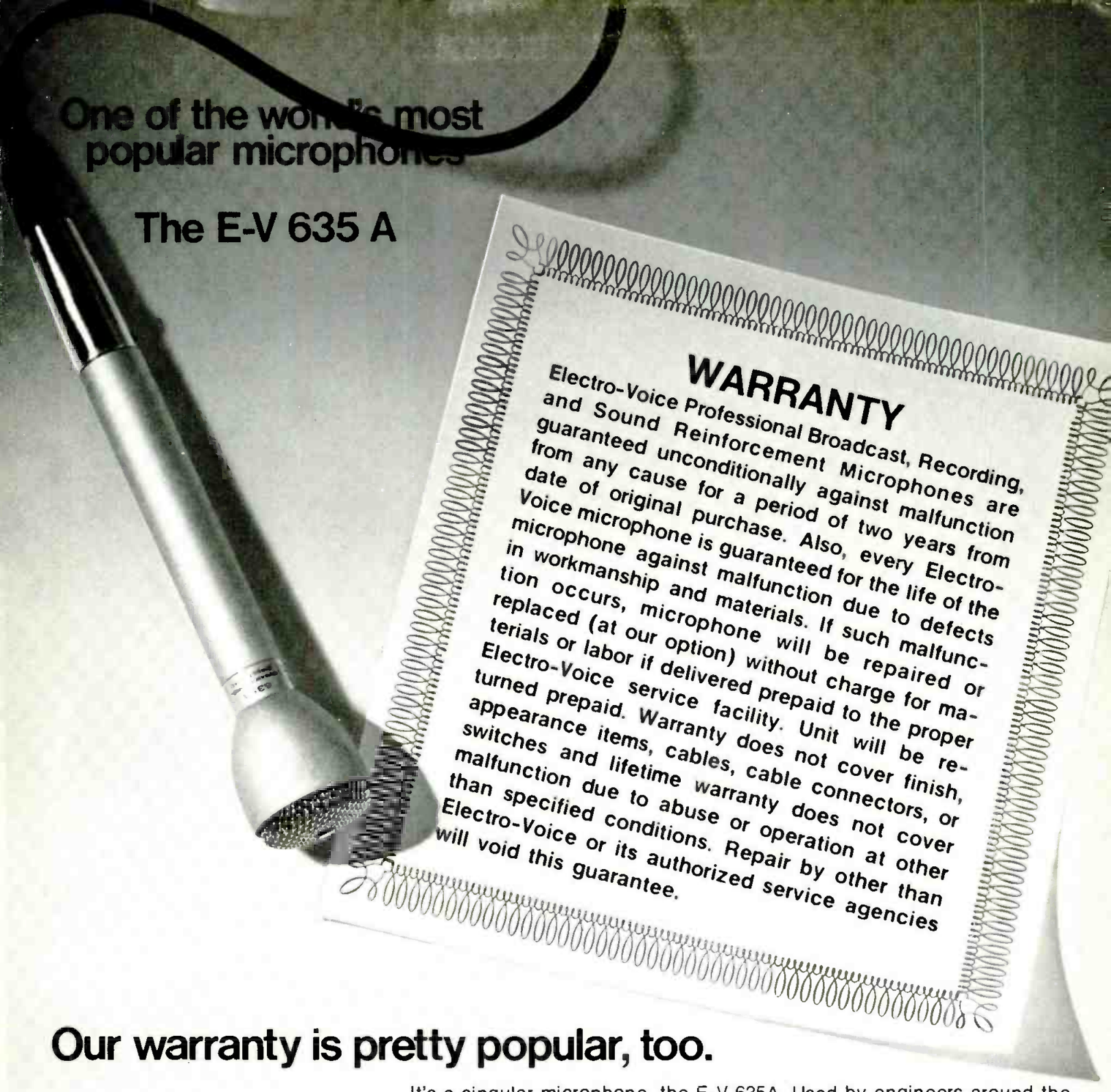
Anyone who knew anything about the WLOX story could only hope that time would wash away Camille and that the station would somehow survive.

So it is with a certain amount of pride that this month we show WLOX alive and doing well. And, as you might suspect, doing well in an unusual way. This, then, is an update on the WLOX Story.

trol. In the same way, we see the need today for more complete automation, to make the most efficient possible use of people, studio facilities and equipment; to achieve economies of operation that will be all but mandatory in the competitive situation of the future; and to improve the product we offer without greater expense. Much of the automation we look for is already here, via the System/7, and we look for the rest to be operational at our small station by year-end.

We feel we are doing no more than keeping up with the trend to automation in the rest of the business world. The station that does not keep up may well find itself bringing up the rear. □

At the transmitter site, Assistant Chief Engineer and Director of Computer Systems, Jim Fleming (right), discusses the IBM Process Communications Terminal with Transmitter Supervisor Fritz Muffler.



Our warranty is pretty popular, too.

It's a singular microphone, the E-V 635A. Used by engineers around the world. On TV, film, radio, in recording studios, and on stage. Chosen because it unfailingly delivers great sound with no fuss. If often seems that the tougher the problem, the better the 635A performs . . . and outperforms the competition. In fact, for many it is the standard by which all others are judged.

But even when things go wrong (as they sometimes do) E-V has the advantage. For instance, for the first 2 years we'll put your 635A (or any other E-V Professional microphone) back in operation fast, for only the cost of one-way postage. Even if you dropped it, or dunked it, or ran over the microphone with your remote truck!

It's a remarkable warranty because we build remarkable products. Designed to serve, and to solve your sound problems day after day. Your E-V sound headquarters is ready to help you select the E-V Professional microphones that exactly fit your needs. Or write us for the latest information on E-V professional sound products. Today.

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Eliminating automation sound

By Dennis Ciapura

"Automation sound" is that mysterious phenomena that some automation equipment salesmen say doesn't exist, but anybody can hear.

My opening statement has undoubtedly had a dual effect: readers who are automation equipment salesmen begin to dislike me, but keen eared engineers and audiophiles recall how easy it can sometimes be to pick the automated stations out of the band of FMers by their sound alone.

When automation systems first became popular, the big challenge was to come up with a system that could execute the mechanics of program sequencing and timing with enough accuracy that the listener would not be aware that a machine was doing all of the switching. It was assumed that the state of the art of tape recording had reached the point where the taped version of the original program source would be indistinguishable from the original, once the robot programmer got it on the air.

While modern automation systems indeed do a remarkable job of airing a smooth flowing program, the fidelity side of the coin still requires very careful attention, if a truly live sound is to be achieved. Some of the problem areas are peculiar to automated systems but many are common to any system where tape links are involved. In the interest of obtaining the best possible fidelity, let's take a look at these problem areas and see what can be done.

There are really two very different types of automated program sources; syndicated tape services and station produced material. If the station is buying it's music from a service, very little control of the source material and recording techniques can be effected other than to press the service for a better product. If the station is rolling it's own, however, there is no excuse for less than perfect reproduction. In either case, the best possible playback characteristics will yield the best on-air fidelity, so let's start with the reproducing end of the system with an eye toward eliminating or at least minimizing any fidelity losses.

Our goal will be an air sound from the tape systems that a listener with sophisticated audio gear will not be able to distinguish from the turntable output of his or her set at home. Sound pretty far out? Not at all, let's see what it takes to do it!

To be able to eliminate "automation sound", we must first determine what factors contribute to it. The three major areas of concern where any audio degradation is concerned are; frequency response limitations, loss of clarity, and noise performance. Automated systems can fall victim to two response losses, one at the low end due to 25 Hz cue tone filtering and the other at the high end due to a combination of tape deck losses, system losses and possibly overprocessing of the audio resulting in excessive limiting at the high end.

The fact that the tape played on the air is at least one generation away from the original program source means that there will be some distortion of the signal as no tape copy is absolutely perfect. But the distortion can be held to an insignificant level, if every element of the system from the tape head to the transmitter output is adjusted for optimum performance. Noise performance can also be optimized to the point where there is no audible degradation, but once again, some careful engineering is required.

Inside the WLAK control room where automation sound is optimized. And it doesn't hurt to carpet the walls!

Sound Comparison

Very often one may listen to the signal at the transmitter output and conclude that technical excellence is in our corner and all is well with the world. That idyllic world can sometimes crumble, however, when the same musical selection is played on the turntable for a direct A-B comparison. This is really the acid

test and one that every chief engineer should make at his facility.

Figure 1 is a simplified diagram of how the equipment may be set up. It is imperative that the turntable used be in top notch shape, of course, and it is recommended that the unit be carefully checked with a test record first to be sure that the response and tracking are up to par. Be especially careful to correct any peaks at the high end. Shunting the cartridge output with a lower than the standard 47k resistor will usually dampen a high end peak. If a response curve flat within 2dB cannot be obtained, the pickup is not suitable for the A-B test and a better model will have to be installed for our comparisons to be valid.

It is not unusual to find a hump in the cartridge response at around 12 kHz, and it is sometimes impossible to flatten it out without losing more than 2 dB at 15 kHz. A good quality unit will generally produce very flat response feeding the standard 47k, however, and setting up the "standard turntable" should not be a difficult task.

Mechanically, the turntable should exhibit good tone arm tracking and low rumble. For the purpose of our tests, try to use a selection near the beginning of the LP as the tracking error of the arm is usually worse near the inner grooves. A really top notch arm should be pretty accurate across the entire disc. If the pre-amp has output level controls, the record output level should be matched to the FM level off the air. This is critically important for an accurate A-B test because the unequal frequency response of the ear at different audio levels makes valid judgement of response equality very difficult.

After the equipment is set up, cue the record selection to the test cut (selected to match a selection that is on the automation ready to be aired) and be ready to let'er rip when the on-air version comes around. If you are able to get the record and the air cut exactly in sync, fine, but it is also useful to have the record version a little ahead of the air version so that the original may be heard first and then immediately compared to the station output of the same musical phrase. We assume, of course, that a good FM tuner is used and multipath free reception conditions prevail for the A-B tests.

Listen to the program at the level that your listeners do. Rock operators have their work cut out for them! The more loudly the music is played the more the little imperfections will stand out. Tape hiss between cuts sticks out like a sore thumb if the original record was clean. As a matter of fact, you may find that a tape which you always thought sounded pretty good is really kind of dull and muddy compared to the original record. This is indeed "the acid test" and perhaps you wonder if it is really too stringent in view of the fact that the audience at home isn't likely to be waiting by the turntable with virgin Berlioz pressing in hand ready to A-B with the Hertzian replica.

The answer lies in the fact that reproduction flaws affect music in varying ways. While listening to every different type of musical construction and instrumentation scheme is well nigh impossible, increasing the sensitivity of audio critique by making a direct comparison back to the original source points out the weak areas before the average listener is likely to be annoyed.

At this point, a look at some of the factors that affect the sensitivity of the tests is important because an inadequate monitoring system or procedure for the tests could render the results almost useless.

The amplifier should have loudness compensation switched in because that is the way most listeners operate their gear and the extra 30 dB or so of bass boost may disclose some hum or rumble problems that the flat studio system has never revealed. The best quality speakers that can be obtained should be used as these are most likely to reveal any distortion of the program material as well as providing a

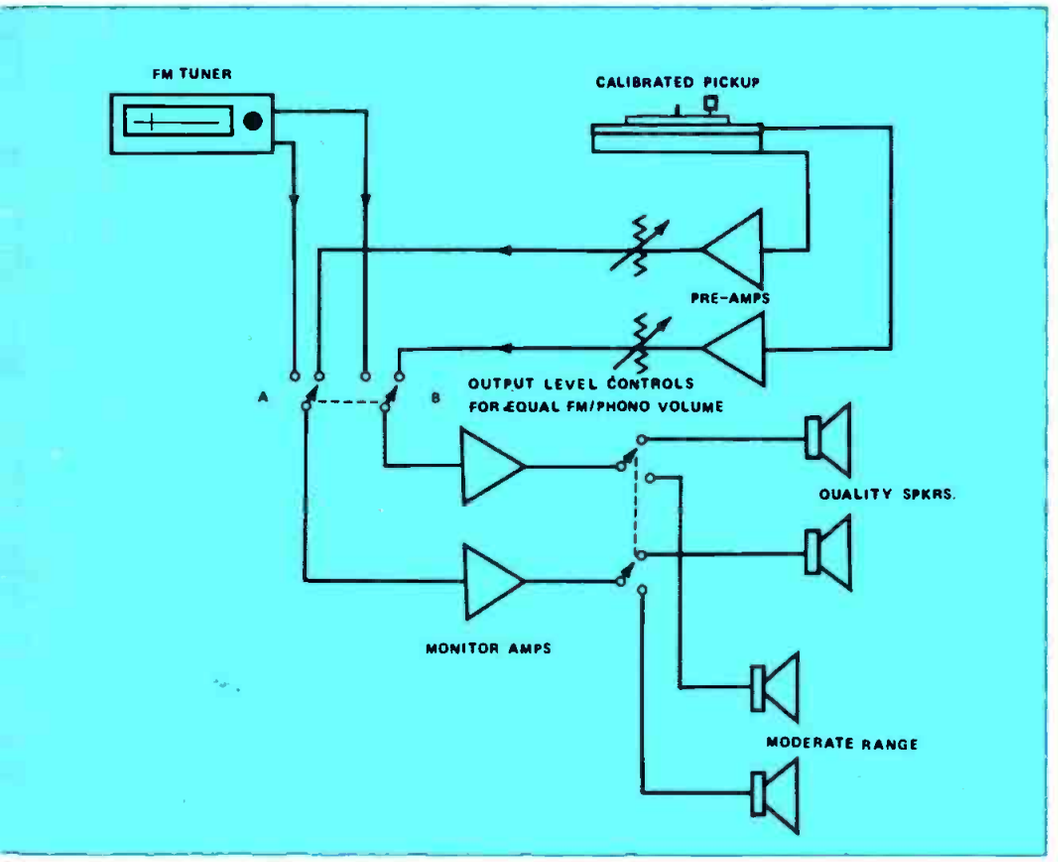

Fig. 1 Equipment set-up for A-B comparison of air sound with the original source from the record.

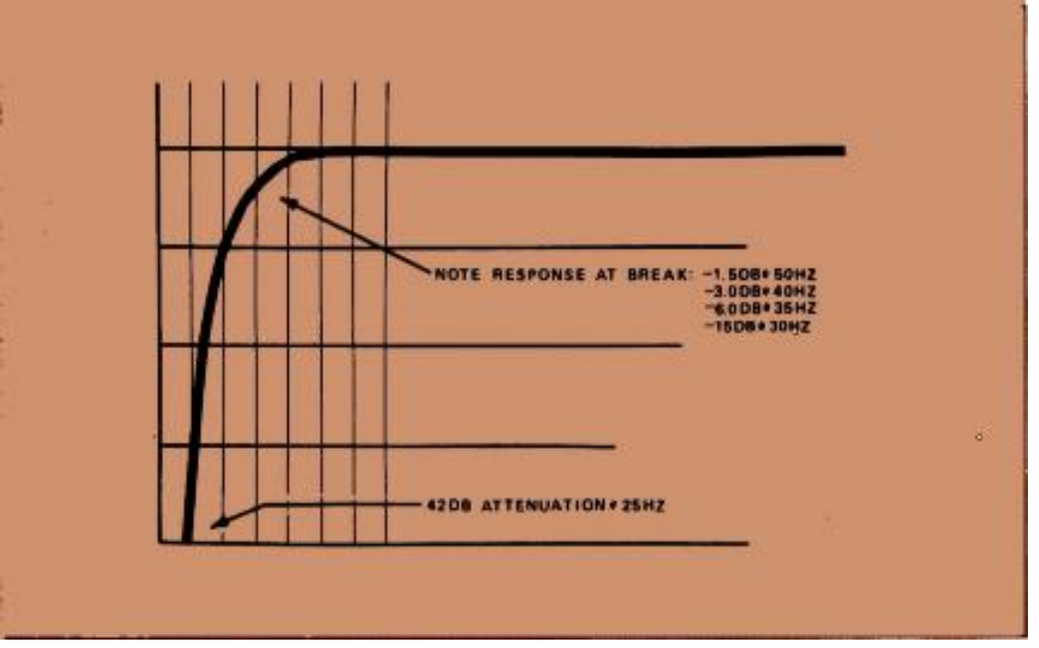

Fig. 2 Typical passive 25 Hz automation cue tone filter response.

wider audible noise bandwidth for the tests. An additional set of speakers with only moderate high frequency response can also be useful, however, as this type of speaker will sometimes make a loss of highs more noticeable at a given volume level because the combination of ear losses and speaker losses may put the perceived level into inaudibility in the top octave.

Now that we are in a position to play electro-musical referee, let's discuss some of the "fouls" that are often found when monitoring automated systems and corrective measures that we can employ.

Correcting The 25 Hz Hurts

Low frequency cue tone problems usually fall into two categories: either the cue tones are too audible or the cue tone filters are filtering out a portion of low end of the music. A combination of these problems can also occur and frequently does. Figure 2 is the frequency response of a typical passive 25 Hz cue tone filter. The 40 dB attenuation at 25 Hz seems quite adequate, but why are the cue tones still audible at home on "the stereo" and not in the studio? The answer is in the equal loudness compensation curve in the receiver volume control which can bring an insufficiently attenuated cue tone up to woofer rattle level at relatively low volume. You may want to think twice about less than a 40 dB attenuation spec, but at the same time the 1.5 dB loss at 50 Hz isn't exactly ideal either. If the same type of filter was employed in the record process to prevent "music trips" of the automation 25 Hz sensors, the loss at 50 Hz totals 3.0 dB! We won't even discuss the response at 35 Hz.

A-B test a record with some really low lows and see how your system holds up. Some pre-amps in common use for production and on air work have low frequency roll-off characteristics that really cut into the bass response. This roll-off is intended to filter rumble, but the 12 dB/octave slope that most of the pre-amps exhibit is really much too gradual for the best quality audio fidelity. So it seems that the best cue tone filtering and anti-trip device would be a filter with as much loss as possible at 25 Hz and flat response to as close to 30 Hz as possible. This response characteristic would take care of the low frequency transients and 25 Hz cue tones and still allow true high fidelity low frequency performance.

Ah, but does such a filter exist? Fortunately it does and is rather inexpensive if you take the time to assemble your own. Commercial active filters are available from quite a few manufacturers and each should be judged on the merits of it's low frequency Q, distortion noise etc. vs price. You may recognize the heart of the circuit from Walt Jung's IC Op Amp Story, May, 1974, **BE.** This circuit is one of many super fidelity circuits that Walt describes in his IC Op Amp Cookbook, and is a good example of how easy it is to solve some of the really sticky problems related to automated broadcast audio systems.

Peak Limiter Input

The key to good high frequency response is not to settle for anything less than flat response to 15 kHz in any one component of the audio chain. Remember that 1 dB loss at the tape deck output, another through the studio equipment, another in the telco loops and another at the transmitter end, all add up and a 4 to 6 dB loss at the listener's receiver is not uncommon.

If your A-B test showed the station to sound somewhat "dulled" compared to the original program source, look for these accumulated losses which seem so insignificant by themselves. Also check for excessive level to the input of the FM peak limiter. This is one area where there is a necessary trade-off. A higher FM peak limiter input level will yield higher average modulation, but heavily scored passages will suffer some degree of treble loss.

The A-B test with the record is an excellent way to gauge the best setting for your individual station. The idea is to get the best modulation level that you can consistent with the fidelity your format requires. Obviously, there is no one right setting for all stations. Stereo phasing is also very important and the station scope should find itself making frequent trips to the main control room for tape head azimuth checks. (See Optimizing Tape Deck Performance, **BE**, Nov., 1973.) As a matter of fact, many automated stations keep a scope permanently connected in the control room to facilitate frequent tape and cart deck checks.

Quality Control

Very often the A-B test will reveal no audible degradation of response but a rather noticeable addition of residual noise. Once again, really careful optimizing of

(Continued on page 60)

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Automated information systems for broadcast operations

By Phil Dean

At station KOB-TV, Albuquerque, New Mexico, a salesman rushes into the traffic department with a late order and breathlessly asks, "Can we clear these spots?" Dorothy Smith, the Traffic Manager, calmly takes the order, goes to a small terminal in the corner of the traffic room, taps a few buttons, sits back and waits. In seconds, the machine begins a staccato stuttering. Within minutes, she tears a read-out off the terminal looks at the salesman and smiles OK.

At WOR-TV, New York, one of the largest independent stations in the country with one of the largest spot inventories in the broadcast industry, a late afternoon rain cancels out the New York Mets baseball game and with it the entire spot program built around the baseball game. Bob Wolfe, head of WOR-TV's traffic operation, calmly goes to his automated terminal, punches a coded button and within minutes a complete listing of a new spot schedule built around a substitute program block especially designed for such emergencies, is implemented into the WOR-TV schedule for the time block normally taken by the Mets game.

At KSTP-TV, St. Paul-Minneapolis, Minnesota, Stanley S. Hubbard, President of the Hubbard Broadcasting Company, talks with his station manager at WTOG-TV, Tampa-St. Petersburg, Fla. and asks how his salesmens quotas are doing as compared to a previous period. On the other end of the phone, Jim Dowdle asks his secretary to get a read-out on all sales figures and within minutes he has them in his hand and can give Hubbard a complete profile up to the minute on all sales activities.

Magic? No. Revolutionary? Yes.

Any of these situations could cause a panic at a number of stations. Salesmen would be screaming, the traffic people would be climbing the walls and facing long hours of overtime and high pressure work and the station manager would have to dig out all kinds of material on his sales staff to provide the information on sales comparisons.

But thanks to a revolutionary concept of automated informational service created and designed by the BIAS (Broadcast Industry Automated Systems) Division of Data Communications Co., Memphis, Tenn., broadcast engineers and station managers now have a new weapon in their growing armory of automated equipment.

The system's major asset is that it provides all of its station clients with "Real-Time, On-Line" access to its computer banks in Memphis. Once programmed to the rigid standards set by BIAS technicians and program experts, it is capable of a wide variety of services ranging from instant availabilities, (the goal of every time salesman in the country), to automatic product protection.

Broadcasters, who normally approach any "revolutionary" change with realistic caution, have become increasingly enthusiastic over this system concept.

Jerry Danziger, General Manager of KOB-TV, one of the first to install the system said, "This system is capable of producing every form of information a manager could want. Not only does it streamline your operation, but it stops you from making mistakes. If you overload a time period, the computer wants to know why. If you're overloaded with spots in any given time period the system tells you so."

"The BIAS system," says Danziger, "often institutes its own dialogue if its not satisfied with the information input and that's what scares me."

At station WOR-TV, New York, this approach has been credited with saving as much as $30,000 in lost spots in one month's time. "Prior to our installing the BIAS system" said Herb Mayes, WOR-TV Comptroller, "credits had been running between $30,000-$40,000 per month. They are down to less than $4000 and we're looking at a potential zero spot loss some time in the future." Mayes estimates that without any increase in sales, the system has increased billings about 10 percent.

More significant perhaps in the broadcast industry's on-going trend towards complete automation is BIAS' contribution in developing yet another automated system which may eventually be adapted to interfacing with programming and production automation systems now in use.

Gerry Deene, Comptroller for the Hubbard Broadcasting Company stations sees the system as another step in eventual full automation on the part of TV stations. "We already have our own computer, an IBM System 3, Model 10. This is the nucleus of what we hope to be a fully automated operation covering every phase from production through administration and accounting. Each of our stations has this system and we are already planning on inter-facing the systems for maximum efficiency."

"Automation is really the key to competitive growth," says Deene, who envisions a new era of broadcast concepts as computerized equipment becomes more sophisticated. The instant communications that have been established via the "on-line, real-time" service has given us a most effective operating tool for broadcast operation evaluation. The range of possibilities for automated activities from engineering and production through the ad-

Fig. 1 A traffic girl at WMAR-TV checks readout from her BIAS console. Station logs, which take hours to put out, can take as little as 30 minutes to assemble.

Fig. 2 Instant communications between stations and their sales reps are part of the computer system. Here Jan Dilley and Blair salesman Gordon Sulcer check an availabilities up-date from the computer.

ministrative operations is virtually unlimited. When all of the various segments of present automated equipment are inter-faced; when the right equipment is placed in the right sequence, we will have a fully automated broadcast operation.

The process of transferring all of a station's record keeping methods into the BIAS computer programs is an eight-week operation. It starts with three days of orientation for the station personnel at the BIAS headquarters where they meet the conversion team.

The first five weeks are used to program the station's traffic operation for the BIAS computers in Memphis. (Two Burroughs 3500's). At the start of the sixth week, "live" operations with the new system are begun and the old system is dropped. The last two weeks of the eight-week "conversion" program are for training and changes in procedures, followed by a final review of the operating system with all hands taking part.

The intensive eight-week program has proved to be highly effective, according to Turner, and once the system is turned over completely to the station, few if any, changes or alterations have had to be made in the basic concept.

For station management and engineering heads, the concept of computerized information systems is another step in the constant battle to simplify systems and economize at the same time. □

Editor's Note:

BIAS is a fine example of what can be done today. There are other systems and unique equipment offerings. And we present these ideas here because the station survives on sales. But sales and availabilities is too often a pressure cooker part of the business. And when nerves are on edge and the pressure is on in a traffic crisis, the account gets a look at happenings that detract from the professionalism of the industry. He comes away from the experience—along with the salesmen—with the uncomfortable feeling he's been in a rat race with time.

What's it like to deal with your station?

Automation perspectives

By Pat Finnegan

A Broadcast Station should never "plunge" into any major automation project. When a thorough investigation has been made, and the results indicate a move is justified—then, and only then, should the step be taken.

This article is not intended to be a blue-print of the planning and decision process, but rather it will point out many aspects and problems that should be given consideration in your planning.

Objectives

The Station should first set up objectives and define the criteria on how to achieve these goals. These are overall station objectives, not individual sections. No section of a station can stand by itself. An automation system should not be considered for one section alone without, at the same time, considering how the system will effect other areas and overall station objectives.

To assist the decision process, however, the entire station may be divided into various areas, and each of these areas considered as a subsystem. (The term sub-system implies a subordinate and integral part of the complete system.) These may be business functions, air programming, transmitter, logging, or as many as you feel are needed in your particular operation. **Any one of the sub-systems may be automated by itself, not just programming.**

It is only when all sub-systems dovetail efficiently that the true benefits of automation can be realized. Sub-systems that do not conform to this principle can result in duplication of efforts, many wasted man-hours, multiplicity of peripheral components, spare parts and supplies. Just one example: two different logger systems, each with its own size and type paper, requires specialized paper supplies and that means stock problems.

The Decision Process

Sound business decisions are made from assessing a large number of hard, honest facts. These facts should be gathered from a realistic look at the station's present operation, the proposed operation, equipment spec sheets, manufacturers' reps, and by visiting other stations. When gathering the facts, many hard questions should be asked and honest answers obtained....even though the answers may puncture some preconceived notions. Facts have the intrinsic nature of continuing to operate whether or not we are aware of them!

Cycling And Recycling

Don't be in a hurry. The process should be allowed to go through a number of cycles. For example: objectives are determined, criteria set and the investigation launched. When the facts come in, they are assessed against the objectives. Usually, this results in a scaling down of objectives (which were probably unrealistic in the first place) and further investigation is made. This cycling goes on until the objectives cannot be compromised further and a decision must be made—accept the project in modified form or reject it altogether.

Some Facts About Automation

All automation systems dictate a certain amount of regimentation to station programming and operations. To what degree this regimentation takes place depends upon the amount of flexibility the station requires. The greater the flexibility, the more equipment and sophistication the system must have. This translates directly into dollar costs, both in the original purchase price and in operating costs.

Automation systems can do a more efficient operating job than human operators and can save man-hours in this specific area. The workload and emphasis, however, will be shifted to other areas of the station, particularly production. New and increased skills will be required of personnel in these areas, and peripheral expenses will be created.

The purchase price of the system and its depreciation schedule, although major, are far from the only costs that will show up on the books. There will also be new costs in operating expenses for replacement parts, maintenance, and supplies. Some of these expenses will be replacements for present costs, but the net result at year's end could show an **increase** in overall expenses.

Station management must determine objectives, criteria and set limits beyond which compromise will not be tolerated—and then be willing to purchase at the start, a system of adequate capacity and

Management Highlights

Successful automated stations don't just happen. They are the result of station research. Don't take for granted that any part of your operation needs to be automated first or last. Put the team approach to work, because there never was a situation where it is needed more.

And remember that operator errors account for most system problems. A number of people must be indoctrinated. Not everyone will understand the electronics, but anyone punching buttons should understand the functions and system capabilities. The machinery itself has a fine track record.

Your share of success in automation will be in porportion to your realistic preplanning.

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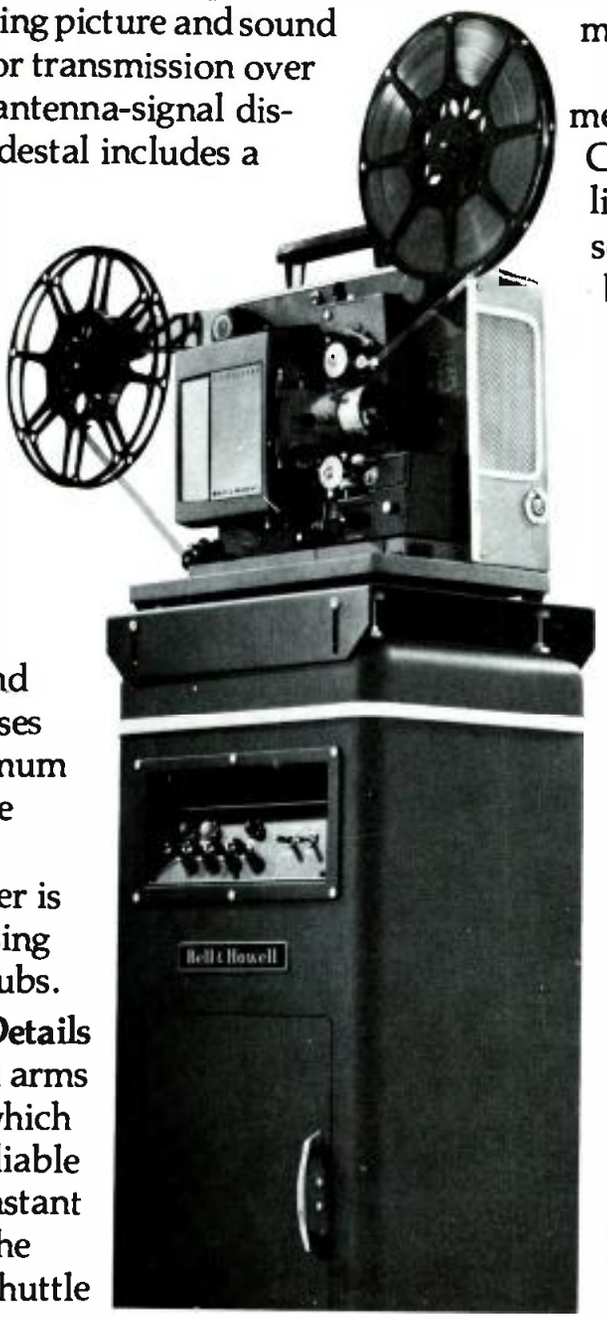

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A Final Thought

The instruction books and service manuals provide the details necessary for installation, both electrical and mechanical, as well as remote control. Contact Bell & Howell, for technical literature and the names of the local sources who will help you select the best combination of lens, lamp and equipment to project 16mm films for TV program distribution or local display.

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sophistication which will meet and carry out these objectives. Otherwise, station judgements can become subordinated to the operational scheme dictated by the machinery and outside sources.

While it is important to collect information on commercial systems available, it is most important to learn **exactly** what the station is now doing. This must be accurate statistical information, not generalities. This will mean tedious work, but the results will provide a far greater insight into everyday operations. Often the cause for disappointments after a system has been installed, is the fact that a particular system will not do things exactly as they were done before.

Go over log sheets for busy days, weekends, and unusual periods such as a ball game or special remote pickups. Gather statistical information on all announcements, whether they be commercials, PSA's, jock chatter, intros or tags on music. Also, review music numbers and types used in any period, newscasts, and other programs such as tapes supplied by an outside source for special programs. Except for music and a few other items, almost all of this will end up on tape cartridges. It doesn't take long to translate all this into a multitude of cartridges, which in themselves become a sizable investment and create handling and storage problems. This will quickly translate into many tape machines and trays.

The Systems Themselves

All automation systems are not alike, although they strive to achieve similar end results and often use similar tape machines. Their methods will vary tremendously. Read over spec sheets carefully but remember that these can only present highlights of the system. Since spec sheets cannot provide all the answers a station must know, all the obviously unanswered questions should be jotted down and presented to the manufacturer's rep for definite answers. It is easy to become mired down in a sea of information about many systems. But, if the station has set out its own objectives and criteria, the information will be limited to the necessities.

One of the ways systems differ is their approach to memory and switching. The memory and switcher in some systems are the counterparts of the operator and console in a live operation. Some memories will provide access to anything in the system while others use some random access along with sequential (one event after another in a fixed routine) operation. Memories not only operate differently, many are different by nature. For example, some use MOS dynamic memories, others use magnetic cores, magnetic disc, others audio cassette style. These can react differently under different situations. For example, the MOS must have power to it constantly or the entire memory information stored is lost when power fails—even for an instant, and must be completely reprogrammed when power returns.

Some memories can be programmed only from a keyboard, while others can accept programming from outside....on punched paper tape, audio tape (with stored memory information) or hardwiring from another memory. Many of these use the ASCII data transmission code (telegraph code) and convert to digital internally. By the use of a standard code such as ASCII, systems can "converse" with each other.

Peripherals

As mentioned earlier, work loads will shift and new and increased skills will be required of some personnel in various departments. For example, traffic personnel must learn new (in some cases) computer languages, or at least a new way of presenting information to the memory, and will also do the actual memory programming. The system can only do as it is commanded, so accurate information must be inserted in the memory. The traffic person now becomes a direct controller instead of working through intermediaries, as in the past. In the operating equipment itself, correct tapes and cartridges must be in the correct trays in the correct machines, because the memory calls up machines and trays, not programs or announcements!

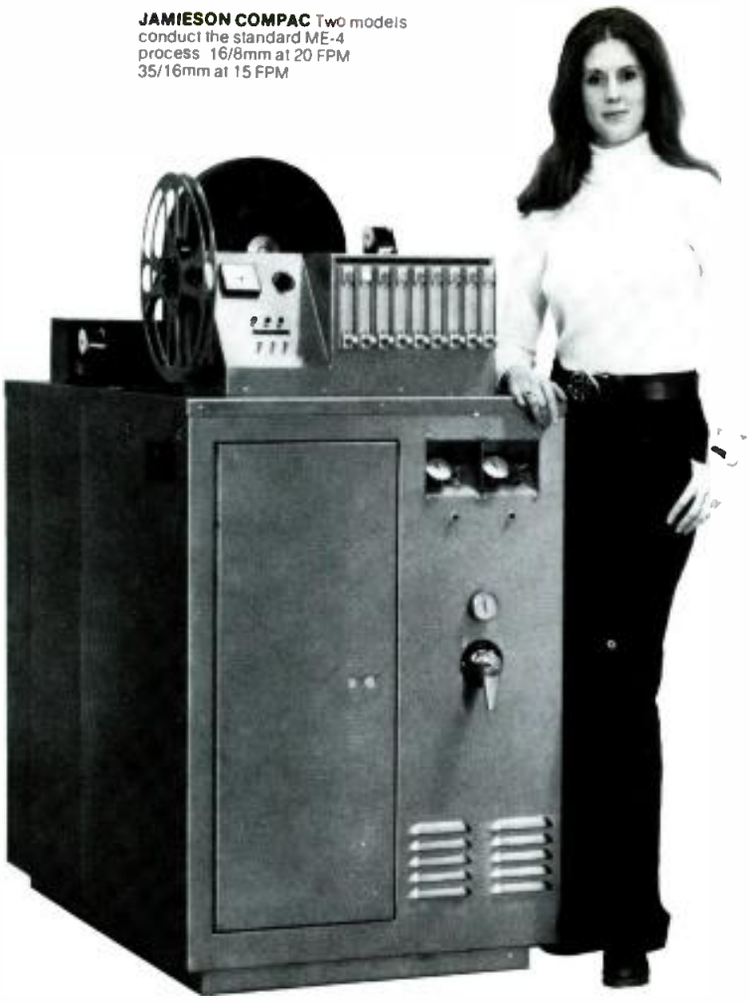
The work load in the production booths will increase tremendously. Many new equipment items must be added so that program materials can be prepared properly for the system installed. This equipment should be of the same quality as the air equipment.

Production personnel must acquire new skills and increase others they now possess. Announcers, for example, must still voice the announcement, but now it will go on tape. At the same time, correct length and placement of control tones must be applied, and logger information recorded, if logging is part of the system. They must be concerned with quality control, run out times, and seeing that the tape is properly labeled and gets to the system in time for airing. (Many a silence sense has gone off because an announcer pulled a tape from the system to update or correct it, and then forgot to get it back in the tray before time for airing!) Carelessness in the booth will show up as poor quality on the air, erratic switching, or system failure.

Put It All Together

The Probe has cycled many times, facts have shattered many preconceived notions, and financial discussions often sounded like the Federal budget. By this time, the facts should speak for themselves, and the decisions that are made only confirm what the facts have stated. But, up until this point you have been dealing only with "ballpark" cost estimates. Unless, at this point, the facts rule out automation altogether, send out for specific, firm bids on an equipment package.

Whatever the decision, it will not have been made hurriedly. Much time and hard work will have gone into the process, and that final decision will likely be a good one. □



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1974 VTR review

By Joe Roizen
*Head of Telegen, Mountain View, Calif., and Video Editor of BE.

Part 1 of a two-part series looking into the electronics and mechanics of VTR's, representing a wide price range and all popular formats.

The burgeoning needs of broadcast television in the U.S. and abroad has created in its wake a proliferation of newly designed television origination equipment that spans a wide spectrum of price/performance ratios. A look at what is becoming available in the VTR field will quickly ratify this statement. At this point in time, at least ten well-known manufacturers* now offer some configuration of quad or helical machine aimed at part or all of the recording applications in broadcasting.

Among these suppliers there are seven incompatible formats which offer no possibility of direct interchange between tapes made on the different machines. This is due, of course, to widely differing mechanical and electrical parameters that went into the concept and development of each model. While it is true that a competitive climate produces a better rodent eradicator, it unfortunately confronts the mouse with a multiplicity of seemingly similar choices that can lead to traumatic indecision. The actual differential in technical specifications, operational ease, and economic factors may be miniscule or monumental, depending upon the facet examined or the viewpoint of the proponent for a particular format.

*Ampex, Fernseh, Echo Science, IVC, Philips, RCA, Rank, Shibaden, Sony, Thomson

Video engineering design teams presented with the same problem have obviously come up with different answers, each of which is an attempt to maximize the advantages and minimize the deficiencies of their configuration while catering to the stated needs of the end user. In a field where the interchange of tapes makes standardization a highly desirable state, it is unfortunate that no overriding characteristic has existed to force at least a uniformity of the mechanical and physical aspects. Since this is not possible, we are left only with the alternative to see how close it comes to meeting these while satisfying the operational requirements of the TV studios where it is adopted.

Scanning Principles

The establishment of the quadruplex scanning principle as a world standard was as much due to the deficiencies of other concurrent attempts at video recording as it was to the innovative creativity of Charles Ginsburg and his team of engineers. Several other systems were racing for the VTR prize in the television industry. Dr. Peter Axon and his research group at the BBC were making credible images on a multi-track longitudinal recorder called "VERA" (Video Electronic Recording Apparatus). Development groups at Crosby Enterprises in Los Angeles and RCA in Camden were also producing monochrome pictures of fair quality, and reports of various helical scanning attempts circulated from time to time through the industries' communicative channels. Had any of these systems reached a sufficiently competitive stage with the fourhead transverse approach, there might now be three or four major VTR formats entrenched in broadcasting operations.

Obviously, the quadruplex system preceded the others by a sufficient margin in time that it became established a standard. The longitudinal approaches were abandoned, and the helical scan principles were pursued only with the intent of

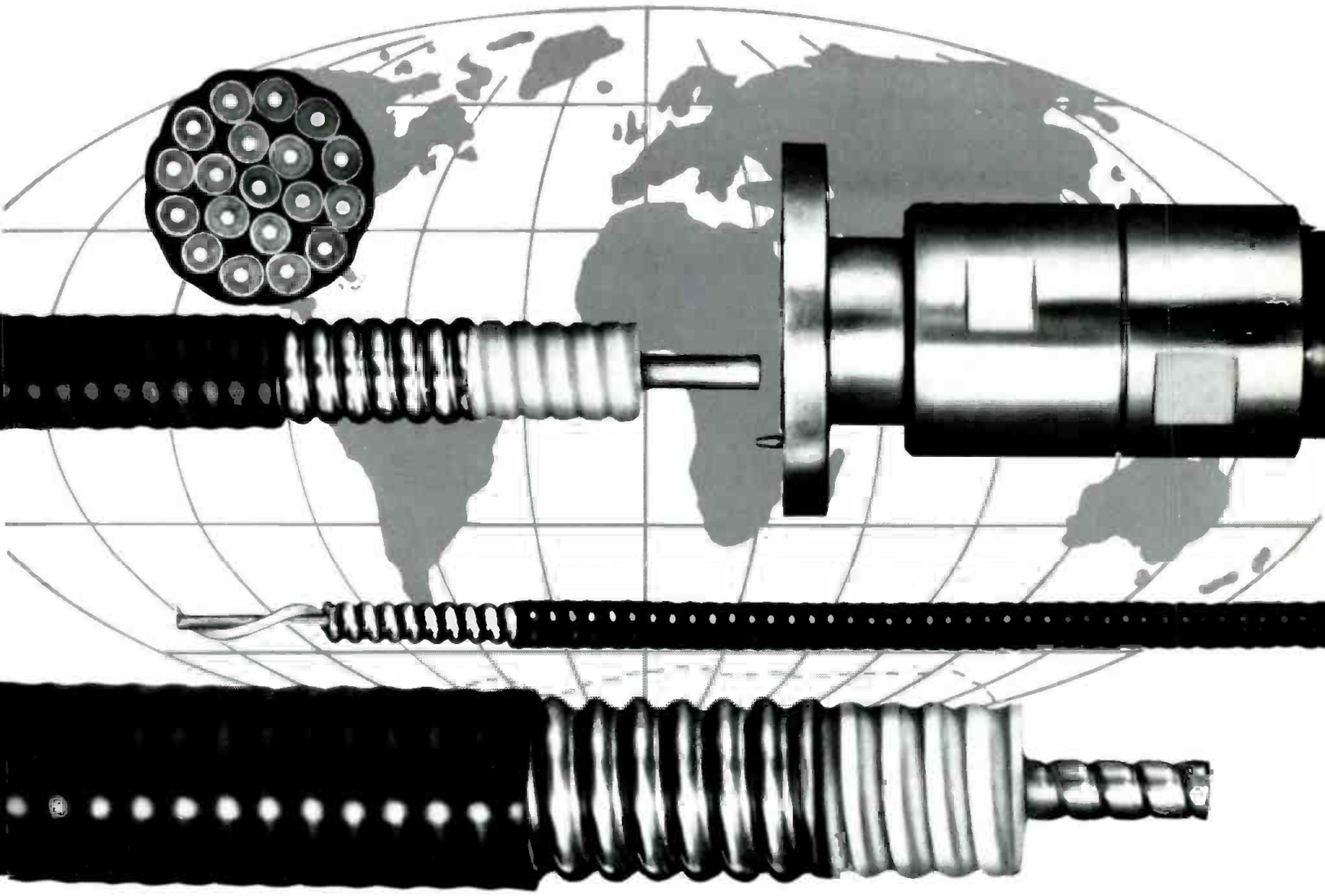
Management Highlights

This two-part series on video tape recorders is authored by Joe Roizen, head of Telegen, international video consultants. As this first part of the series goes to press, the Roizens are busy setting up the video end of an exposition in Peking.

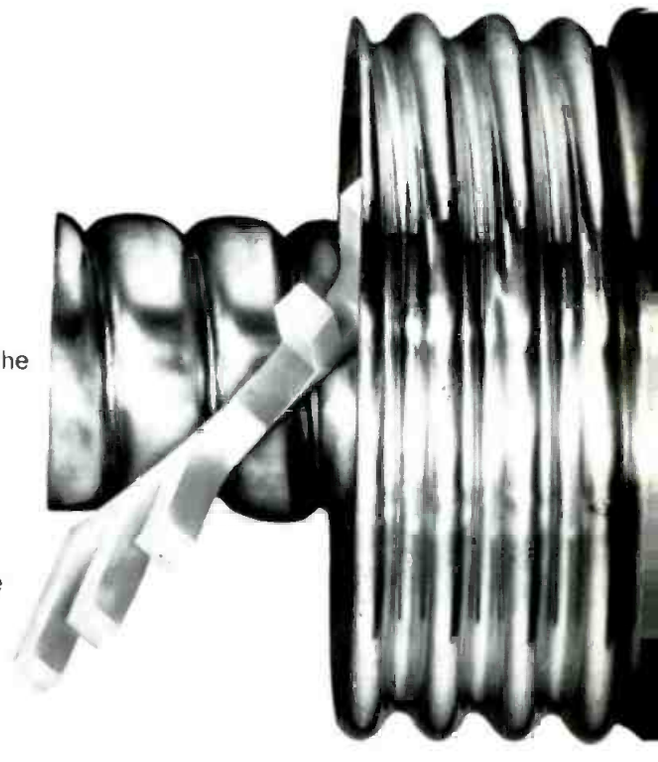
Roizen has been tied to Ampex and IVC, but when this series was written he was connected with neither company.

As was true with the video camera series, Roizen has set out to give perspective to key considerations in the selection of new equipment. No one machine is best for all applications.

The big stir these days, of course, is the introduction of the broadcast quality helical machine. Its major obstacle is the fact that the quad format is entrenched world-wide. Still, the helical machinery will make its own way.



WORLD LEADERSHIP IN COAXIAL CABLES AND WAVEGUIDES



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filling substantially less demanding market places.

In examining the quadruplex format in relation to any major substitution of mechanical parameters, it becomes evident that little effort has been employed up to now in that direction. There are to date no transverse scanning machines with different tape widths or numbers of heads. Most quad machines today offer an alternate half-speed mode of operation (i.e., 7.5 ips). So far, only educational stations operating in monochrome with restricted budgets have considered this mode as a practical method of utilization.

Over 7,000 quads are now in use worldwide and they do offer interchangeability of tapes recorded in accordance with SMPTE or IEC standards. In the past year the major suppliers of quad VTR's have been proposing new approaches to improving the characteristics of this format so as to accommodate the growing need for added audio facilities, address coding and lower operating cost. These proposals have been loosely labeled as *Quad I, I-A and II, and provide varying degrees of compatability with the present quad format.

A similar analysis of the helical or slant track recording principle shows a different situation. Helical recorders, now in general use, encompass tape widths of 2", 1", ¾", ½" and ¼" widths. Longitudinal speed varies over almost as wide a range, as does head scanning speed. Track configurations go from a minimum of two longitudinal tracks to as many as five.

The variations hardly stop there. There is a further separation in helical systems which would be defined as full helical or half helical, because of the tape path being scanned in 360°, or 180° wraparound. The former system usually employs a single video head, while the latter utilizes two. In both cases a full field is written with every head scanned, although here also there is an occasional exception where a displaced lower performance head fills in the dropout period in the vertical interval.

The straightforward helical systems may also choose to wrap the tape somewhat differently around the scanner. The two basic wraps are known as Omega or Alpha, these Greek letters being chosen because they physically resemble the actual tape path. With the alpha wrap there are two further subclassifications of a butt joint or an edge overlay configuration.

Not satisfied with these options, two of the most recent entries into the VTR field have adopted what they consider to be the best features of the quadruplex format and tailored them to operate with a helical scanning arrangement. This format is known as segmented helical scan. It's essentially a halfway mark between the now traditional forms of both transverse and helical recording.

Tape Width

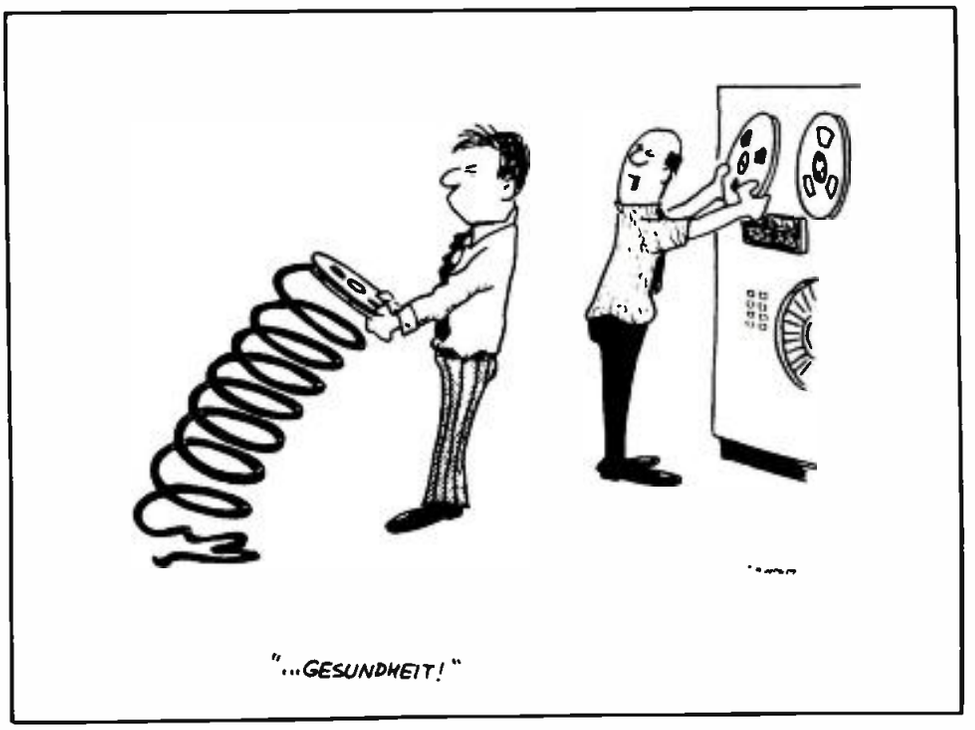
The physical transverse dimension of the tape is not in itself an absolutely mandatory factor as long as certain limits are not exceeded. Either 1" or 2" tape operating at appropriate longitudinal speeds and achieving similar packing densities per square centimeter of tape will, theoretically, yield identical results. There are, however, some significant differences that can greatly affect operational factors with regard to good interchange, reliable tracking, number of auxiliary tracks, etc.

Magnetic tape is an elastic medium with physical properties dependent upon the chemical nature of the backing and the oxide, as well as the effects of the operating environment. In fabricating the tape, the manufacturer can only achieve certain slitting tolerances with regard to the width of the tape. An equal slitting error will have a greater effect on a narrower tape than on a wider one. A 2" wide tape having the same physical characteristics as its 1" counterpart will exhibit twice the resistance to longitudinal tension and at least three times better transverse rigidity.

It is no wonder, then, that several of the early attempts at practical helical recorders were based upon 2" tape*. As video tape recorders begin to require additional longitudinal tracks to accommodate more sophisticated program, sound and picture editing, the allocation of space along the edge of the tape for these auxiliary tracks further reduces the available tape area for the video signals. A wider tape inherently makes these new requirements easier to cope with from an original design standpoint.

Writing Speed

Technology in audio recording has by now achieved a level in which an adequate buffer exists for excellent sound reproduction at relatively low longitudinal tape speeds. In video recording, that



*BE/Dec. '73

*Ampex 650, Sony PV100, Loewe Opta.

desirable state has not yet been reached, and there are very definitive limitations with regard to the writing speed of the video head and its conjugate read characteristics. The combinations involved here are many. Tape formulation, particle size, and grain orientation are all fundamental factors in the tape medium's ability to accept and reproduce short wavelength signals. An additional significant factor is that as the deposited wavelength on tape gets shorter, the immunity from separation loss becomes poorer, and dropout activity increases.

Since the wavelength on tape is directly proportional to the linear scanning speed of the head, it becomes imperative that the scanning rate be high enough so that adequately long wavelengths at the highest desired frequency are recorded. With the increasing emphasis on multiple generation of color recordings, the frequencies used in the FM transfer process between the video input signal and the RF signal laid down on the tape have been steadily climbing. Practical recorders today employ carrier and deviation frequencies that extend from the low band standard of 5.5 to 6.5 MHz up to the super high band range of 9 to 12 MHz.

With present tape characteristics and the practical head gap widths that are now in use, it is preferable that wavelengths on tape exceed 75 microinches for the highest recoverable frequency. Beyond this wavelength, the tradeoffs in signal-to-noise become unacceptable.

For the reasons given, helical recorders aimed at broadcast specifications with direct color recovery systems generally have writing speeds around 1,000 inches per second, and several of them are in the vicinity of 1500 ips, which puts them in the same category as the quadruplex machines, as far as that particular parameter is concerned.

There are, of course, other factors that may alter a VTR specification by a few dB at any given writing speed. These include more sophisticated electronics for signal handling, highly specialized video head transducers and higher energy tapes.

One Head or Two?

As with all choices, neither of the above fully satisfies an optimum requirement for a video tape recorder. The single head system is simpler in many ways, because it requires no careful matching of head characteristics between a multiplicity of heads. It requires less electronics in terms of drive circuitry, playback preamplifiers, and switching arrangements, and because it must be used in a way in which a full field is written with every head scan of the width of the tape, there are no differential effects such as noise or chroma banding in the reproduced image.

While these factors highly favor the use of the single head approach, there are a few deficiencies that cannot be avoided. The single scan/single field parity dictates a track length of considerable dimension at the desired writing speeds. As a result, the long, thin video track (which is usually in the order of six mils), stretched across ten or more inches of longitudinal tape presents some interchangeability problems.

Because there is only a single head which must at some point in its travel leave one edge of the tape to engage the other, there is a short period of signal dropout which, under the best of circumstances, is several video lines in length. This dropout period must be carefully positioned during the vertical interval so as not to be visible in the image. Since other equipment in the TV studio would function improperly if a sudden discontinuity in the sync train were to appear, it is necessary to have additional circuitry which regenerates properly timed and shaped blanking and synchronizing signals to insert in the missing area.

The guiding and tension control of the tape in such a "long path" scanning assembly must be very precise in order to guarantee proper tracking of the narrow track. It is in this area that environmental and other physical effects to the tape tend to deteriorate the ability of the system to interchange tapes perfectly.

A secondary problem is the fact that the differential tension across the length of the tape accumulates time base errors during the scan period to form a maximum displacement error at the crossover point. This requires a time base corrector with a wider window to pull in the geometric distortion and its color phase derivative to the tolerances required for proper color reproduction. Several single head helical machines using both direct color recovery and chrominance subcarrier transposition techniques on the NTSC and PAL Standard have been successfully demonstrated and are now in their initial stages of evaluation by present or potential users.

To avoid the disadvantages of a single-head system, VTR designers have recently come up with a two-head approach which still retains the major benefits of the helical configuration. A two-head system permits a continuous flow of video information on and off the tape with sufficient overlap to provide for complete continuity of the signal. There is, therefore, no dropout period at the crossover point which must be filled in; rather, there is the typical logic selected switching point during a horizontal blanking period where it is invisible in the reproduced image.

The progress of head technology has produced a new family of hot pressed ferrite transducers which have excellent frequency response characteristics up to 15 MHz, well beyond the needed frequency spectrum. Head-to-head uniformity further minimizes the problem of equalization between heads and the likelihood of the most subjective quadruplex cyclic errors, such as banding, first line hue shift, etc. Having selected the two-head approach, the designer need only decide what degree of segmenting must be adopted in order to accommodate the mechanical parameters of the scanning and transport system.

The economy of the two-head approach is exemplified by its wide use on half-inch EIAJ standard machines. Obviously, the addition of the extra head and its associated circuitry on these low-cost machines is adequately offset by the simpler threading path and the elimination of crossover reinsertion circuitry. However, most of these low-cost machines still record one field per head scan, with relatively slow writing speeds designed to accommodate the limited requirements of

closed circuit applications.

With higher writing speeds and shorter video track lengths, the angle of the track becomes greater and the image itself is segmented into discrete numbers of lines. The specific segmentation is a product of a variety of electrical and mechanical parameters. The segmented helical recorders using dual video heads, that are becoming available today, operate to electrical specifications that compete with those that have become common on the best quadruplex recorders.

Operational Factors

The major comparisons that are presently being made between various types of helical video recorders slated for broadcast uses generally tend to compare against the standard quadruplex machine operating in its 15 ips mode. On this basis, it is obvious that virtually all of the helical recorders have at least a 50% advantage in tape consumption and some additional benefits in headwear.

The tape factor is a significant one. Tapes used in quadruplex machines are subject to considerable wear because of the methods of scanning and spooling that are employed. Except in the very latest machine, the spooling technique does not employ a constant tension principle in any of the wind modes and, therefore, tends to pack the tape in a non-uniform arrangement. This renders the stored tape subject to eventual deformation because of mechanical shock in handling or environmental cycling. All too often a tape removed from the archives with important program material will contain cinch windows that have formed while in storage. Replaying the tape on the quad VTR will usually result in severe dropout activity in the areas on the tape that have been physically distorted.

The scanning principle itself is another handicap for the tape medium to pass through. The tape is constrained in a metal female guide which holds it in extremely precise positioning for the proper transversal of the video heads. The negative tolerance employed between the tape and the pole tips means that the transducers strike the edge of the tape virtually at right angles.

The severity of this problem caused some attempts to be made to chamfer the guide at the upper entry point, so as to relieve this edge strain. Unfortunately, the by-product of that experiment was a less satisfactory interchange on color tapes because of the effect on reproduced signal accuracy. The chamfering was short-lived and the guides were returned to their original shape.

Most of the helical recorders use scanning principles which do not employ femal guides but which allow the tape to "float" over a rotating scanning assembly. The video head which projects into the tape deforms the tape only to the degree of the tapes own compliance. Depending upon the wrap angle and the entry and exit point of the tape, the video head (or heads) in this configuration need not touch the edge of the tape and enter into contact with the tape at slight angles, which minimize initial physical or electrical disturbances. The result is that helical recorders in general exhibit far longer head life and assure greater reuseability of the tape itself.

A recent survey of quadruplex head life has indicated that in North America on the NTSC Standard, average head life ranged between 400 and 500 hours. A similar survey in a few PAL countries in Europe showed a considerably lower average closer to 300 hours. One would expect the reverse to be true, because both the PAL and SECAM color standards are somewhat less demanding than NTSC as far as head performance is concerned. The only explanation would be that European television stations are more critical of VTR performance and the extended bandwidth with its higher color subcarrier in use there makes quad head defects more readily visible.

In either case, helical recorders operating on the same standards provide thousands of hours of head life in addition to permitting simpler and easier interchange of the head assembly itself.

The fact that most helical machines were designed more recently to take advantage of some of the newer solid state circuitry means that there is much less redundancy of circuitry in these recorders. Rather than separate accessories that process the signal in repetitive fashion, the helical recorders perform the necessary time base corrections, etc., through the use of plug-in circuit cards. This has contributed greatly to their operational ease and maintenance simplification.

A Look At The Hardware

We have so far reviewed the major design parameters and operational characteristics from a somewhat theoretical viewpoint. There are of course, major differences between the various recorders manufactured by different companies, and it would be useful to summarize at least those recorders being actively promoted into the broadcast market at the present time.

Since quadruplex videotape recorders all produce the same tape format and are built to relatively rigid industry standards, there is not much point in describing in detail the different configurations produced by the four major suppliers. On the basis of machine population numbers, Ampex is the leader in this field and presently offers a range of quad VTR's, which includes the VR-1200 series as the major median priced AVR-1 recorder for master origination, automated operation and sophisticated production editing. The ACR-25 quadruplex cartridge machines are for rapid sequence commercial insertions.

RCA which enjoys the second largest share of this market, also offers a series of incrementally priced quadruplex units called the TR-50, 60 and 70, that satisfies most studio operational and origination requirements. RCA was also first to introduce the cartridge concept through their TCR-100 machine and have achieved significant market penetration.

In Europe, Fernesh-GMBH have captured a small market share with their quadruplex unit, mostly in countries with German oriented engineering attitudes. In Japan, Shibaden has satisfied a 50% segment of the Japanese market with four-head transverse recorders.

Ampex of course also produces

(Continued on page 61)

Our Proc/Amp and DOC cure the helical-VTR-blues. Also the reds and greens.

If the only thing bothering you about your helical VTR is the picture you play back, you can relax.

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Simplifying digital math

By Harold Ennes

In this second part of a series, the author explains how to multiply and divide zeros and ones.

In this Part you will learn binary multiplication and division. But first, let's examine the solutions to exercises at the conclusion of Part I.

Solutions To Part I Exercises

1. Modern broadcast equipment is rapidly absorbing logic circuitry. Basic to the understanding of logic circuitry performance is binary math. Also, digital math is one interface between the human operator and the computer.

2. (a) 0110 = 4+2 = 6
   (b) 1001 = 8+1 = 9
   (c) 0101.101 = 4+1+0.5+0.125 = 5.625
   (d) 1110.01 = 8+4+2+0.25 = 14.25

3. (a) 1110 (decimal 14)
   (b) 1011 (decimal 11)
   (c) 10110 (decimal 22)
   (d) 1111.11 (decimal 15.75)

4. (a) 0100
   (b) 0110
   (c) 0001
   (d) 0110.01

Multiplying Zeroes and Ones

Binary multiplication is identical to decimal (base 10) multiplication. But in your conventional decimal system, you must have a multiplication table including the numbers from 1 to 9 multiplied by any number between 1 and 9. In the binary system, you have only a zero or a one, therefore a highly simplified multiplication table.

For example, 7x3 = 21. Here you said to yourself "7-14-21." Now 7x3 in binary notation is:

```
  0111
x 0011
  ----
   111
  111
 -----
 TOTAL
```

Note that all you have are the 1's in their proper weight column. Since 0x1 = 0, you have only two rows in this example to add for the total as:

```
  111
 1110
 ----
    1  (0+1 = 1)
   0   (1+1 = 0 and carry 1)
  1    (1+1+carry 1 = 1 and
        new carry 1)
 0     (1+carry 1 = 0 and
        carry 1)
 1     (1 carried)
 -----
= 10101 = 16+4+1 = 21
```

We have just reviewed the binary addition technique of Figure 3 and Table 3 (Part I) for convenience. Remember that binary multiplication is identical to that of base 10, but you must use proper binary **addition** technique.

You can observe an interesting and useful point at this time; binary multiplication is extremely simple, and binary addition takes more practice than multiplication. Binary multiplication involves no complicated tables at all since it is only 0's and 1's. When you get considerable practice in binary addition, (and subtraction), you will feel entirely "at home" in its application. **This is very important because you will soon discover that a computer actually multiplies by over-and-over addition, and divides by over-and-over subtraction.**

Another important correlation between the conventional decimal and binary systems is as follows:

In the decimal (base 10) system, if (for example) 12 is shifted left one time (120) you have multiplied once by 10. If 12 is shifted over two times (1200) you have multiplied twice by 10.

In the binary (base 2) system, if 1100 (decimal 12) is shifted left one time (11000), you have multiplied once by 2. (Decimal 24). If 1100 is shifted left two times (110000) you have multiplied twice by 2. Decimal 48).

This should emphasize in your thinking that a one-space shift in the binary system is simply a power of 2 change rather than the power of 10 change in the conventional decimal system.

As another example of multiplication take 12 x 13:

```
   12
 x 13
 ----
   36
  12
 ----
= 156
```

In binary form, 12 x 13 is:

```
   1100
 x 1101
 ------
   1100
  0000   ---(Note that this row
          not necessary
 1100
1100
-----
= 10011100 (See Figure 4 for con-
            version to decimal)
```

Binary Multiplication By Addition

You do binary multiplication on paper as just described. But computers multiply by over-and-over addition. A 5 MHz flip-flop will perform five-million such operations per second.

A calculator, whether it's the "old fashioned" mechanical type or the latest electronic digital type, makes use of two registers; the **accumulator** and the **multiplier.** The accumulator starts with all zeroes, and the multiplier keeps account of the number of additions performed.

Let's see how the base 10 calculator finds the product of 12 x 13 with over-and-over addition. See Figure 5 and observe the following step-by-step operations:

In step 1, we recorded zeroes in the accumulator column and the multiplier (13) in the multiplier column. In step 2, we place the multiplicand in the accumulator. In step 3 we have the first addition (000+012 = 012). Since we have performed one addition, we reduce

the multiplier by 1 (13 reduced to 12). In step 4, we add the multiplicand again. Step 5 is the new sub-total and the multiplier is again reduced by 1. In step 6 we add again with the new sub-total in step 7 where the multiplier has now reduced to 10. When the first order digit of the multiplier is reduced to 0 as it is in step 7, in the next step (step 8) the multiplicand is moved 1 space to the left as shown. (Now the multiplicand will be added 10 times in each step). Thus in step 9, the multiplier has reduced to 0 and the total in the accumulator is the answer.

The binary method of obtaining the product 12 x 13 is shown by Figure 6. Here are the step-by-step operations:

In step 1 we recorded 0's in the accumulator, and the multiplier in the right-hand column. Step 2 records the multiplicand in the accumulator. Step 3 is the first addition which reduces the multiplier by 1 (1101 reduced to 1100). Now note that the **last two** digits of 1100 are 0's, so the next step (step 4) shifts the multiplicand **two** spaces to the left as shown. Step 5 is the new total, and cancels the third digit in the multiplier. Thus the multiplicand moves 1 space left again for step 6. The new total in step 7 is the answer, since the multiplier has reduced to 0.

Let's look at a very simple example of 8 x 8 = 64 in binary form. In binary, 8 = 1000. Put down the accumulator register and the multiplier register as:

ACCUMULATOR	MULTIPLIER
00000000	1000
1000-----	
Total = 1000000	0000

Notice that the three 0's in the multiplier shifts the multiplicand 3 spaces to the left in the accumulator to get to the next digit in the multiplier. Thus in this example the very first addition reduces the multiplier to 0 (cancels the fourth digit) to obtain the answer 1000000 = 64 in decimal form. You should at this point be immediately able to see that since the 1 is in the seventh space to the left, it is equivalent to decimal 64. Although it is not necessary to memorize complicated multiplication tables, it **is** essential to memorize the positional weights of powers of 2 such as in Figure 4 and Table 5.

Binary Division

Binary division on paper is identical to base 10 division. For example:

BASE 10 DIVISION

```
   3 (answer)
5 | 15
    15
    00
```

BINARY DIVISION

```
   0011 (answer)
101 | 1111
      101
      101
      000
```

As another example, divide 16.75 by 4 in base 10 and binary forms:

BASE 10 DIVISION

```
   4.1875 (ans)
4 | 16.75
    16
     7
     4
     35
     32
      30
      28
       20
       20
       00
```

BINARY DIVISION

```
        100.0011 (ans)
100 | 10000.110
      100
      00000 110
            100
            100
            000
```

As a check, the binary answer of 100.0011 = 4+0.125+0.0625 = 4.1875.

If this is giving you trouble, review Table 4.

Binary Division By Subtraction

Division can be accomplished either in the base 10 decimal system or the binary system by over-and-over subtraction. For example, 18 divided by 6:

```
 18
-6
 12 First subtraction
-6
  6 Second subtraction
-6
  0 Third subtraction
```

The number of subtractions is 3, so 18/6 = 3.

18-6 in binary form:

```
 10010
-00110
 01100 First subtraction
-00110
 00110 Second subtraction
-00110
 00000 Third subtraction
```

Here again, the number of subtractions is 3, which in binary form is 0011. On paper:

```
      00011.0 (ans)
110 | 10010.0
        110
        00110
        00110
        00000
```

Remember that binary division technique is identical to base 10 methods, but you must use binary subtraction technique as covered in Part I.

Exercises For Part II

1. Solve: 1001 x 0100
2. Solve: 1110 X 0101
3. Solve: 1111 x 1111 by over-and-over addition using accumulator and multiplier registers.
4. Solve: 101111.10 - 001101.01

Solutions to these exercises will be found at the beginning of Part III which will explore converting and simplifying number systems. You will also learn the most convenient way to convert decimal (base 10) numbers to binary digits. □

NEW PRODUCTS

Mike Channel Equalizer

A new state-of-the-art equalizer for individual microphone channel use is available from **Modular Devices, Inc.**, Bohemia, New York.

Known as Model 3000 the new unit is the latest in a series of equalizers and joins Modular Models GME-20, AE-20 and SME-20. Model 3000 features three independent overlapping frequency ranges - 50 Hz to 500 Hz, 300 Hz to 3 kHz, and 1.5 kHz to 15 kHz. Each range has its own continuously variable center frequency and bandwidth controls. The degree of equalization of the bell shaped response is individually selectable in twelve discrete steps from -12dB of dip to +15dB of boost.

Another important feature of this new unit is a voltage controlled equalization "in-out" switch and LED indicator for use with automated programmers. The small size of Model 3000, 1½"w x 5¼"h x 6"d, low noise, and transformer coupled output makes it ideal for use in a wide variety of audio applications.

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Recorders And Duplicators

A U.S. subsidiary company, called **Otari Corporation**, has been established in the San Francisco area by Otari Electric Company of Tokyo, Japan. Purpose of the new company is to provide nationwide distribution of Otari's extensive line of magnetic tape recorders and duplicating equipment, as well as to provide complete service and parts back-up. Heading up the American company are Mitsuo Takekawa, president, and Brian F. Trankle, marketing manager. Trankle was with Ampex for 17 years in several top management posts, including most recently, international product manager for the Ampex Tape Division.

Products to be offered in the U.S. include:

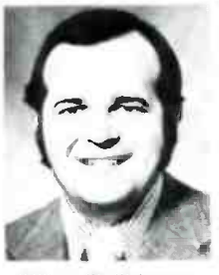
MX-7000 Professional Recorder, a

(*Continued on page 55*)

PEOPLE IN THE NEWS

William W. Weismann has been appointed sales supervisor, retail market, for 3M Company's Magnetic Audio/Video Products division. . . .Appointments of two key managers in RCA Broadcast Systems' Control Equipment Engineering and Product Management group, Camden, N.J., have been announced. **Fred W. Huffman** has been named Manager, Control Equipment Product Management, and **Floyd R. McNicol** has been appointed Manager, Control Equipment Engineering. . . .**R. Colin Parkhill** has been appointed RCA Broadcast Systems sales representative for Virginia and the District of Columbia.

Gilbert P. Wyland has been named General Manager, Engineering and Operations Technology, CBS Television Stations. . . .**John M. McLane** has been appointed eastern regional dealer/distributor sales manager for TeleMation. . . .**Wally Wheaton** has been promoted to district sales manager for the Chicago area for Switchcraft, Inc. . . .Eastman Kodak Company directors elected **Kenneth M. Mason** an assistant vice president. Eastman has also appointed **Leonard F. Coleman** as regional sales manager, Midwestern region, in the marketing division's motion picture and audio-visual markets division of the U.S. and Canadian Photographic Division.


William W. Weismann


Gilbert Wyland


John M. McLane


Wally Wheaton


Kenneth M. Mason


Leonard F. Coleman

Acrodyne Industries, Inc. has announced the appointment of **John I. Skarbek** as Project Engineer, Microwave Amplifiers. . . .**Harry Dornbrand** has been appointed Executive Vice President of Fairchild Space and Electronics. . . .**Robert J. Horak** has been appointed to the newly created position of Marketing Manager of the West Coast Operations of Ailtech, a Cutler-Hammer Company. . . .**Robert M. St. Pierre** has been appointed Division Vice President and General Manager for the Applied Technology Division, Sciences & Systems Group, of Tracor, Inc. . . .**Donald R. Beall** has been appointed as president of Collins Radio Co. a

Robert J. Horak

Frank J. Deighan

Hiroshi Tada

Rodney R. Maddison

R. Clifford Rogers

J. Bernard Denker

part of Rockwell International Corp.

Frank J. Deighan has been named president of Strand Century Inc. . . .Sansui Electronics Corp. has appointed **Hiroshi Tada,** formerly Vice President and General Manager, to Executive Vice President, New York. . . .**Rodney R. Maddison** has been named president of Commercial Electronics, Inc. Formerly Vice President, Marketing, he is being replaced in that postion by **George A. Grasso**. . . .Rupert Neve Inc. has announced the appointment of **R. Clifford Rogers** as Eastern U.S. Sales Manager. . . .**J. Bernard Denker** has been named advertising administrator for Davis Manufacturing Division of J I Case, Wichita, Kansas.

Radio/TV

Wayne Goetz has been named Engineering Supervisor for WOW-TV, Omaha, Neb. **G. Flynn** retired as Director of Engineering after 38½ years with WOW Radio, WOW-TV and KEZO, Omaha. . . .**Donald J. Harnett,** C.P.A. has been appointed controller of Suburban Broadcasting Corp. . . .**Jon Hart** has joined the sales staff of WSJV-TV (28) Elkhart, Ind. as an account executive. . . .**William P. Hinds,** Sales Manager of WKSS, Hartford, has been promoted to station manager.

Richard Silvera has been appointed Chief Engineer, WHLI AM/FM, Hempstead, N.Y. . . .**Peter Ford** is the new Director of Engineering at WKBN Radio and Television, Youngstown, Ohio. . . .**Larry Todd,** former anchor man for KTVT (Channel 11), Fort Worth-Dallas, has been named Managing Editor for WRR AM in Dallas and **Robert Walke** has been appointed local sales manager of WRR AM.

William P. Hinds

Peter Ford

Larry Todd

Station to Station

Operator Tips Are Needed

Station-To-Station pays top rates for exchange items that give hints and suggestions on how to solve nagging problems or unique production tips. We also will include industry letters in this column when we think they will be of interest to the industry. And, of course, we want to encourage you to send in pictures of that new facility, control room, transmitter site, recording booth, or whatever your station considers its bright spots.

In our recent automation survey, we found that most problems were based on operator errors and the fact that buyers did not anticipate the extra production load. So how about it, stations and manufacturers. Any helpful ideas for the state of the art?

Photos need not be taken by a professional, nor do you need to be a professional writer. Send your ideas or materials to: The Editor, **Broadcast Engineering**, 1014 Wyandotte, Kansas City, Mo. 64105.

What's It Cost?

This is a gripe to the industry more than anything; to wit: "Why don't manufacturers and suppliers put prices in their information packets?". Whether you are looking for a new mic preamp or a new 25 kW FM rig, one of the processes involved in the selection process is the cost. Spec sheets tell you if the unit will do what you want it to do but that's not the whole picture. If your selections have similar specs then you want to save the company money if you can. Even if your choice is outstanding in specifications it might be priced out of sight (we can't drive Lincolns all the time).

Prices do change from time to time, often quite sharply at times due to the international money situation, but even ballpark figures are helpful. It is ridiculous to spend another two weeks to obtain a price sheet on something that it took a month to get info on.

It's enough of a hassle to get the Boss to spend his hard-earned money in the first place, so "Hey, you out there, give a guy a break and tell me what it costs!"

Robert Craig, C. E.
WUBE-AM/FM
Cincinnati, Ohio

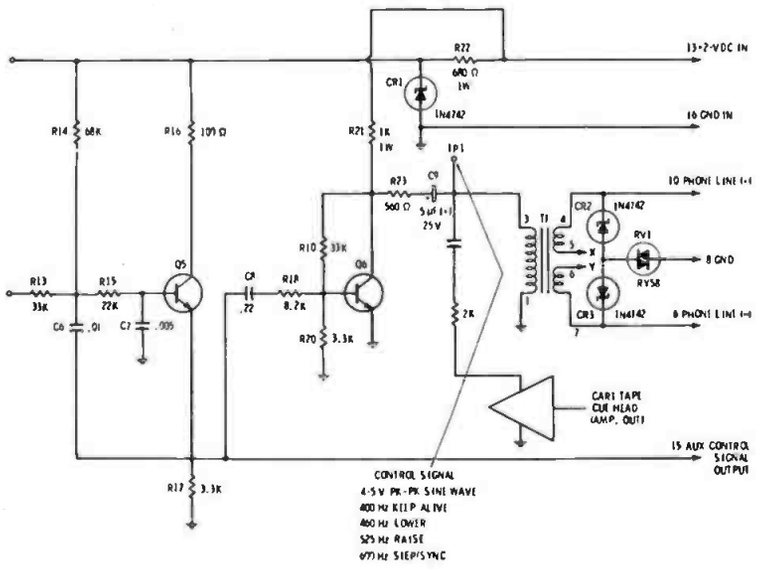
Editor's Note: Okay, any comments from the manufacturers side? And from what we hear, it might also be fair to include a note with promotional literature as to when

equipment will be available. Truth is, the manufacturer often is stuck with units nearly finished but held up for the lack of a few simple parts. It's not their fault . . . it's their headache. Parts availabilities . . . . that's an industry-wide problem.

Locating Cart Tape Splices

Good recording practice requires that a tape cartridge be cued past the splice to prevent the drop-out which occurs as the splice passes the heads. Locating the splice visually is time-consuming and inefficient. At WHAS a simple modification to our Gates-ATC cartridge machines, requiring only a DPDT switch, locates splices automatically.

Our machines are equipped with 8 kHz tertiary cue facilities which were not being used. The splice in the cartridge usually will cause a severe drop in the level of the 8 kHz tone. This drop is used to stop the machine.



The modification consists of removing the internal jumper across the remote stop terminals, pins 4 and 5 of J1 on the transport. These pins are strapped to pins 12 and 13, the normally-open contacts of the 8 kHz relay, and to one set of the DPDT switch contacts, used to restore the stop circuit during normal operation. The other set turns on the 8 kHz oscillator for splice chasing, via pins 7 and 8 of J603 on the record amplifier.

To locate splices, the machine is started with the added switch in the "normal" position. The tertiary cue button is depressed, recording enough tone to energize the 8 kHz relay. While holding the tertiary cue button, switch to the "test"

position. The relay will provide a closed contact for the stop circuit, but only as long as the tone is being received. As the splice passes and the tone level drops, the relay opens and the machine stops. Cartridges with badly worn or misaligned tape will be rejected. A further refinement is the connection of an audio voltmeter to the cue amplifier output for direct indication of tone playback level, and thus of cartridge quality.

If our 8 kHz facilities had already been in use, simply using extra contacts on the normal-test switch would have enabled us to use this modification.

Charles R. Strickland
WHAS
Fern Creek, Ky.

Tape Ready Relay

Here is an item for your "Station-to-Station" feature in **Broadcast Engineering** magazine.

We have encountered a problem here at KNOE-TV where carts are inadvertently left in the "ready" position for extended periods. Several drive motors have been replaced and we believe these extended periods have been a factor in motor loss.

An Amperite 26N0180 relay has been added across the ready light and its contacts wired to a 60 Watt lamp with a button flasher (available at hardware stores) installed in the lamp socket. Should a cart be left at "ready" for a period of three minutes, the lamp will flash alerting personnel to remove the cart. See schematic.

I trust your readers will find this a useful item.

Bill Blanton
Trans. Supervisor
KNOE-TV
Monroe, La.

"AUTOMATING OUR STATION FROM SCRATCH,-HUN?"

NEW PRODUCTS

(Continued from page 49)

field proven machine available in ¼ and ½ inch versions, with one to four channels of electronics. Principal features are three speed electrically-switched operation (15, 7½, and 3¾ ips), rugged construction for long term reliability, built-in test oscillator to speed bias set up and amplifier adjustment, and a universal power supply for 115/230 volts and 50/60 Hz operation.

Model DP-6000 High Speed (240 ips) Duplicator System is available in cartridge and cassette versions. It includes a bin-loop reproducer and up to 20 slave units. The bin-loop reproducer features a vacuum system for quiet operation and gentle tape handling, and a dual capstan drive configuration. A dual capstan drive is also a feature of the slave units.

Model DP-4050 In-Cassette Duplicators are designed specifically with the needs of the spoken word and educational user in mind. The DP-4050-OC has a reel-to-reel master with six cassette slaves. The DP-4050-CC has a cassette master with five cassette slaves. Duplicator speed ratio is 8 to 1.

Model DP-6750 is a cassette tailoring machine that winds and automatically splices both prerecorded and blank cassettes.

Otari Corporation just moved into its U.S. headquarters in a newly constructed building at 981 Industrial Road, San Carlos, California 94070. At this location are the marketing and sales offices, service laboratory and parts inventory, demonstration room, and warehouse.

For More Details Circle (66) on Reply Card

Test Equipment

Ballantine Laboratories, Inc. has introduced a new series of solid-state broadband AC Voltmeter/Amplifiers with significant state-of-the-art advances for analog average-responding instruments of this type.

The Ballantine Models 3045A and 3046A are rugged, portable precision AC voltmeters which also function as precise gain broadband amplifiers and AC to DC converters. Both offer an unprecedented broad bandwidth for analog average-responding type instruments—5 Hz to 15 MHz—and are useable to 20 MHz. Also featured is 100 μV full scale sensitivity with 12 ranges plus a "Range X 0.1" Mode. The instruments provide full scale voltage ranges from 100 μV to 300 V. Accurate readings down to less than 30 μV can be made with the 100 μV full scale sensitivity. With an optional probe, measurements can be made to 1000 Volts.

The Model 3045A has a linear voltage and a logarithmic dB scale; the Model 3046A features Ballantine's logarithmic voltage scale and a linear dB scale. At no additional cost a front panel control is provided on the Model 3046A which allows a 3 dB adjustment of sensitivity. This feature permits the user to set the meter to a convenient level, such as 0 dB, when making relative measurements.

For More Details Circle (67) on Reply Card

Phase Lock Head Bracket

Broadcast Electronics has introduced a new stereo head mounting and tape guidance system—designated PHASE-LOK II—as standard equipment on all SPOTMASTER® stereo tape cartridge machines. PHASE-LOK II sets new standards in minimizing phase differences which degrade frequency response, change channel relationships, and increase cross talk in FM stereo transmissions.

The original PHASE-LOK, specifically designed to meet the critical demands of stereo performance, has

won acclaim from broadcasters since 1971 and was the first to meet the requirements of England's Independent Broadcasting Authority—the first regulatory body to require specified phase performance from cartridge machines.

The new PHASE-LOK II incorporates this same performance and adds features of its own: Adjustable head penetration to provide proper head wrap for different manufacturer's cartridges; Preset head height and zenith for minimum adjustment; Side azimuth adjustment capability for external adjustment of multiple deck units; Simplified head replacement, usually only azimuth adjustment is required; and Independent azimuth adjustment with the smooth microlever which gives little interaction with other adjustments.

For More Details Circle (68) on Reply Card

Portable Audio Sweep/Function Generator

Designed for audio service work, this hand-size, impact-resistant generator weighs less than 1½ pounds, and with its battery power supply can be operated anywhere with complete line isolation.

The **Wavetek** Model 30 features 2 Hz to 200 kHz simultaneous sine, square and triangle waveforms plus sweep. Automatic sweep mode gives a frequency change of 1000: 1, either logarithmically or linearly. Full voltage control of the generator requires only 0 to 1 Volt, either DC for programming discrete frequencies or AC for FM operation. The sine wave output is variable up to 1 V rms.

A recharger is available, and can be used for unlimited line operation.

For More Details Circle (69) on Reply Card

Audio Mastering Tape

Ampex Corporation has announced that it has developed a super-oxide tape for professional audio mastering studios which sets the highest standards in the industry for performance and quality.

John L. Porter, vice president-general manager of the Ampex magnetic tape division, said the new audio tape is the Ampex Grand Master.

"This super-oxide audio mastering tape achieves the lowest level of distortion, plus the maximum in saturation capacity and output capabilities," Porter said. "It is specifically formulated for critical recording applications where the ultimate in sound quality is required."

Ampex Grand Master professional audio mastering tape was demonstrated for the first time at the 1974 Audio Engineering Society's convention and show in Los Angeles May 7-10.

For More Details Circle (70) on Reply Card

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 1¾ 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 F.C.C. envelope-delay predistortion filter and a data filter for character generator requirements are each available at added cost.

DYNAIR Electronics, Inc. manufactures a complete line of television accessory equipment for the broadcast, educational, industrial and CATV industries. The company is also a major manufacturer of aircraft communication and navigation equipment.

For More Details Circle (71) on Reply Card

Videotape Duplication System

A real-time duplicator that will reproduce multiple copies of IVC format color videotapes has been announced by **International Video Corporation.**

For low volume requirements, a single system containing four IVC-825A recorders can be used by itself to make four copies of one program simultaneously from a master recorder or program source. For intermediate requirements, it is possible to modify one system to operate as a control station for a second four-deck system to make eight copies simultaneously. For large applications, a single master control station is used to operate up to eight or more systems and to handle as many as three programs simultaneously.

As an option, RF distribution is provided in lieu of video distribution. The use of one modulator per program channel at the master control, instead of separate modulators at each VTR, simplifies level setting and maintenance and will provide a uniform RF signal to each VTR head preamplifier.

For More Details Circle (72) on Reply Card

Peak VU Detector

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

The VU306 modules are intended for use in tape recording, reproducing, record cutting, and in FM broadcasting applications. They also enhance the versatility and flexibility of

sound mixing consoles, simplify microphone placement in concert halls and public address installations, and add to the reproduction quality of high performance Hi Fi installations. As a rule-of-thumb, Burwen Laboratories has found that virtually all consumer Hi Fi music suffers from sound distortion, typically as inadequate amplifier power, or limited preamplifier dynamic range, clip off signal peaks.

A precision full wave peak rectifier within the VU306 module measures individual signal peaks within 5 microseconds, develops a proportional DC output that remains steady for two seconds. The DC output activates any standard d'Arsonval VU meter. After each 2-second "hold" period, the module automatically takes a fresh sample and displays that for the ensuing two seconds.

For More Details Circle (73) on Reply Card

Strobe-Beacon

If you read the Direct Current column of our April issue, you know the FCC may some day require strobe-beacons on towers in certain cases. These units are offered by **Dielectric Communications,** a division of Sola Basic Industries.

For more information on these units and their control panels, use the Reader Service Card number under this item.

For More Details Circle (74) on Reply Card

RF Power Monitor/Alarm

Bird Electronics displayed their wide line of RF instruments. Along with other headliners was their new RF power monitor/alarm called the Wattwacher 3167 and 3168.

This instrument is designed for the protection of transmitters, transmission lines, antenna systems, and diplexers from damage due to high standing waves.

It gives accurate and simultaneous forward and reflected power indication displays a continuous view of VSWR conditions and power output.

It also offers automatic shutdown of the transmitter if a fault occurs. Audible and visual alarms may be remoted. Choice a fail-safe or non-fail-safe mode selected by rear switch. Failure of control circuitry or AC power to the Wattcher shuts down the transmitter in the fail-safe mode. In the non-fail-safe mode the transmitter remains undisturbed.

For More Details Circle (75) on Reply Card

FM Subcarrier Program Audio Diplexer

The **Coastcom** SBC 415 adds more headroom and an extra margin of noise and video interference immunity to broadcast audio transmission systems. Since it is designed for the most demanding satellite and transcontinental network audio performance requirements it should insure an extra performance margin on your STL.

The SBC 415 consists of a highly linear solid-state modulator capable of very low distortion and wide FM deviation, the output of which is diplexed above the video signal by a high impedance bridging network. The demodulator, in turn, recovers the diplex signal from the composite video/audio signal and is capable of ultra linear detection of the FM subcarrier in the presence of high video interference and noise.

For More Details Circle (76) on Reply Card

Sideband Analyzer

Someday we'll have to get manufacturers to explain how they set up model numbers for a trivia column. Like the model 3706?

Well the model number may be of little consequence, but the unit function and operation isn't....especially if

it's the **Telemet** sideband analyzer. At the convention, Telemet was displaying their model 3706 that features a single channel plug-in crystal controlled VHF tuner, crystal filtered dual conversion IF and a final IF bandwidth of ±5 kHz.

It also has composite or noncomposite outputs, variable sweep rates including manual control, 7 discrete crystal markers, and 1 MHz crystal comb frequency markers across the sweep width.

For More Details Circle (77) on Reply Card

Digital Remote System

A totally digital remote control system at an affordable price has been developed by **Moseley Associates, Inc.** The DRS-1 Digital Remote System is an answer to the high cost of digital transmitter plant remote control systems.

The basic system has a 10-channel control/telemetry capability, with each channel providing one telemetry and two command functions. The DRS-1 Digital Remote System can be field expanded to 20- or 30- channel capability. Also optionally available with the DRS-1 is a 24-channel status/alarm subsystem. The Model DLS-1 Digital Logging System is a companion unit providing automatic recording of up to 20 parameters, plus time of day. The system records parameters at preset time intervals, when an out-of-tolerance condition occurs, or when manually initiated.

Interconnection requirements are a single Series 3002 data (voice-grade) line; audible command and telemetry in the 300 Hz to 2600 Hz range. Also optionally available is a completely wireless radio (STL) system made possible by the addition of an interior subcarrier generator and demodulator for command information. Subaudible telemetry is also available with the DRS-1.

For More Details Circle (78) on Reply Card

Automation Survey

(Continued from page 22)

the lack of knowledge and/or indoctrination by operating personnel, and you'll see why some managers have pulled out of automation or are reluctant to get started.

It's unfortunate that programming still takes the limelight.

Equipment monitoring and control (as well as logging and switching) have been solved by automation, but too many people won't consider these assistance areas because they can think of automation only in terms of programming. Why, automation can stretch even into lighting.

It often pays to visit another station and talk with them about how they're using automation. But keep in mind that format compatibility, system knowledge, and operator indoctrination are prime areas for consideration when you're shopping for or operating with automation. □

Eliminating Sound

(*Continued from page 32*)

equipment operating points and frequent quality control checks pay off in keeping the air-product clean. Automated systems sometimes contain more links in the audio chain, and this area of performance (s/n) is one where little degradations adding up can quickly make an audible difference. Each audio component should have a noise level of 70 dB below **program level.** If the program level is 10 dB below the maximum output level for head-room, the S/N ratio required is 80 dB.

It is important to realize that several audio components with noise levels only 60 dB below program level will have a combined noise level which is quite audible. Even if the station "proofed" at -60dB, remember that under actual operating conditions the mid-range audio level is somewhat lower than the 100 percent modulation level that the "proof noise" was related to.

If the A-B test shows the "air" signal to be pretty clean sounding by itself, but a bit muddy when compared to the original, look for a system distortion level exceeding 1 percent or so. Check the distortion level with everything in the circuit including the AGC's. If harmonic distortion tests indicate clean performance but the "air sound" is still muddy, make an IM distortion check before you decide that your ears are distorted. Some distortion

problems related to amplifier stability won't show up with a single frequency test input.

The advent of the new super fidelity audio components and transmitters affords the broadcaster an excellent opportunity to purge his facility of automation sound, and I'm sure that the automation equipment salesmen are more than eager to prove that automation sound doesn't have to eminate from anybody's station. If your A-B test series and subsequent investigations lead you to the conclusion that your system, as it stands, just is not capable of faithfully reproducing the original program material, then it's time to update the equipment to remain competitive. At this point, perhaps some of the automation equipment salesmen are back in my corner. □

VTR Review

(*Continued from page 44*)

(or assembles) quadruplex VTR's in Nivelles, Belgium for the Common Market, and through a joint venture in Japan called, Toamco for the Far East Market.

The quadruplex machines that are available today for all television applications represent the highest priced VTR's, if optimum performance configurations are purchased. As a matter of fact, quadruplex machines have shown an almost steady increase in average price since their entry into the market in 1956. It is the more recent competition of newly introduced helical VTR's that has caused a reassessment of the quadruplex format, in order to find ways of continuing its domination of the recording field. Both Ampex and RCA have made proposals to standards committees, and the industry at large which promise to alter the quadruplex format sufficiently so that operational costs and features will match the new helicals.

Next Month

There are of course, quite noticeable differences between the various helical recorders themselves, and a few of the major characteristics are reviewed in Part Two of this series on a major machine basis. □

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

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

WANTED

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

TAX DEDUCTABLE donations wanted. All types of audio equipment (patch panels, ATC's, equipment racks, etc.) needed. Will pay shipping costs. Contact: David Wall, c/o Merrimen Avenue Baptist Church, Sound Control System, Asheville, North Carolina, 28801. 7-74-1t

WANTED—Fisher Model K-10 Reverb Unit With Springs. Call Mr. Nonemaker, WHB Radio Station, Kansas City, Missouri, 64105. 7-74-1t

WANTED: All surplus radio broadcast equipment, 250 Watt FM transmitter, console, mikes, amplifiers, players, etc. Serafini Box 404, Lindenhurst, N.Y. 11757. 7-74-1t

EQUIPMENT FOR SALE

MOTORS FOR SPOTMASTERS
NEW Paps hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price $39.00 each prepaid, while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.
TAPECASTER TCM, INC., Box 662,
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ONE STOP for all your professional audio requirements. Bottom line oriented. F. T. C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32505. 7-71-tf

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

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

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

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

EQUIPMENT FOR SALE(CONT.)

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

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

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

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

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

MICA AND VACUUM transmitting capacitors. Large stock; immediate delivery. Price lists on request. SURCOM ASSOCIATES, 1147 Venice Blvd., Los Angeles, Cal. 90015 (213) 382-6985. 6-74-12t

FOR SALE: McMartin B-803 Dual Channel mono console. Less than two years old. Good condition. Contact Tedd Tramaloni WHRW-FM, S.U.N.Y. at Binghamton, N.Y. 13901. Phone (607) 798-2137. 6-74-2t

UHF TRANSMITTER. RCA type TTU-18 television transmitter. Requires minor work & parts. Ideal for standby unit or components. Located: Muskegon, Mi. Contact John Sullivan—CE, WMTU, WWH, Houghton, Mich. 49931. (906) 487-0603, (616) 726-2415. 7-74-1t

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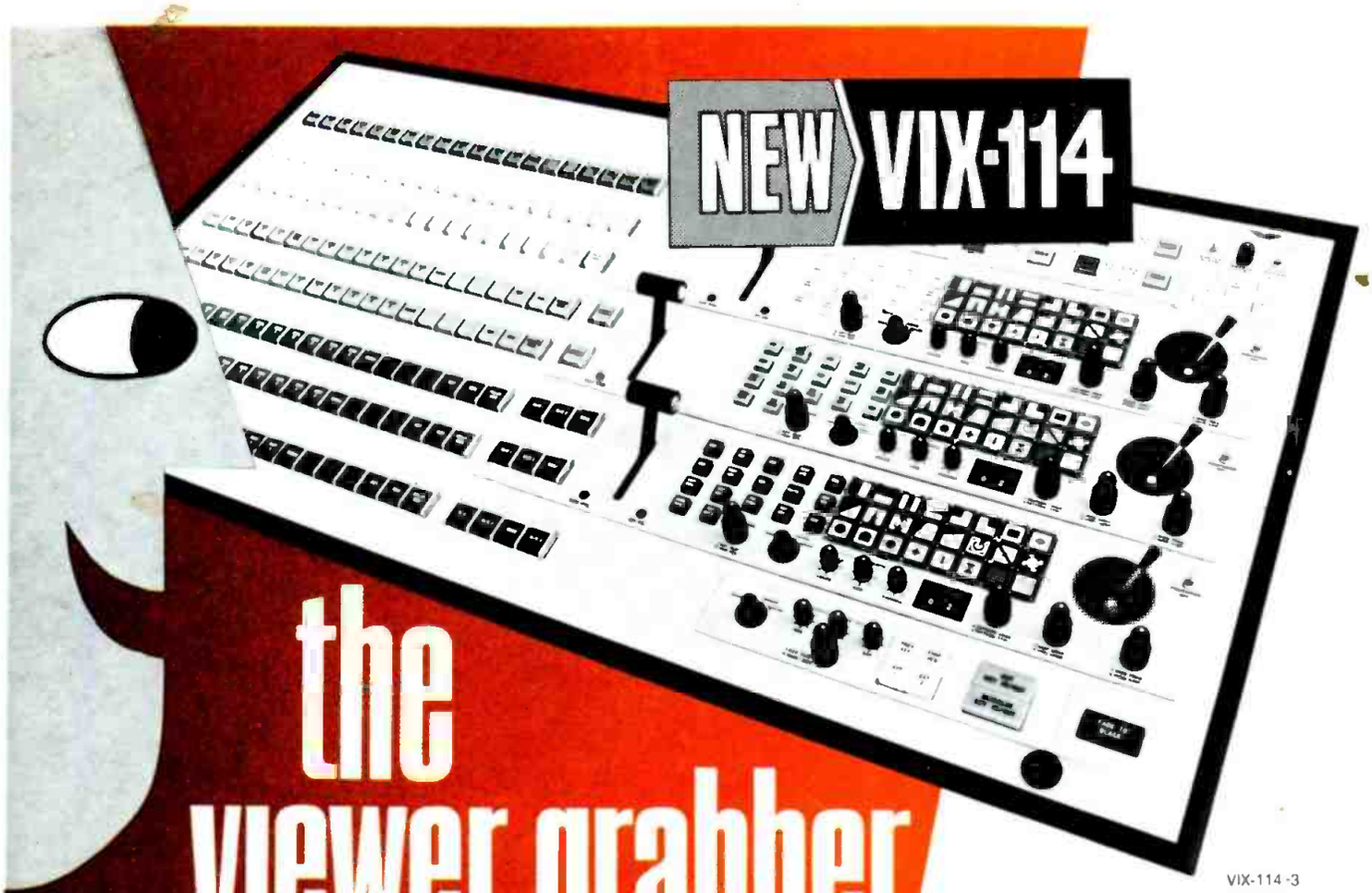

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