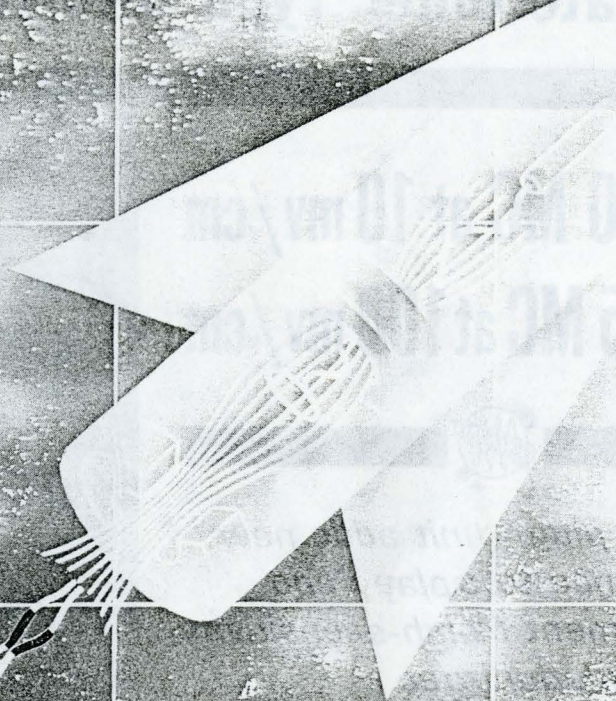
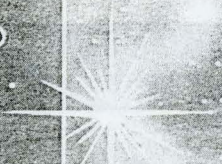


JANUARY 1964



ASTRON

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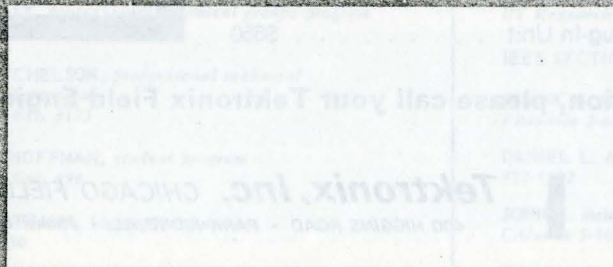
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CALUMET SUBSECTION TOUR	JAN. 20
SHOWTIME 1964	JAN. 26
FOX VALLEY SUBSECTION	FEB. 5

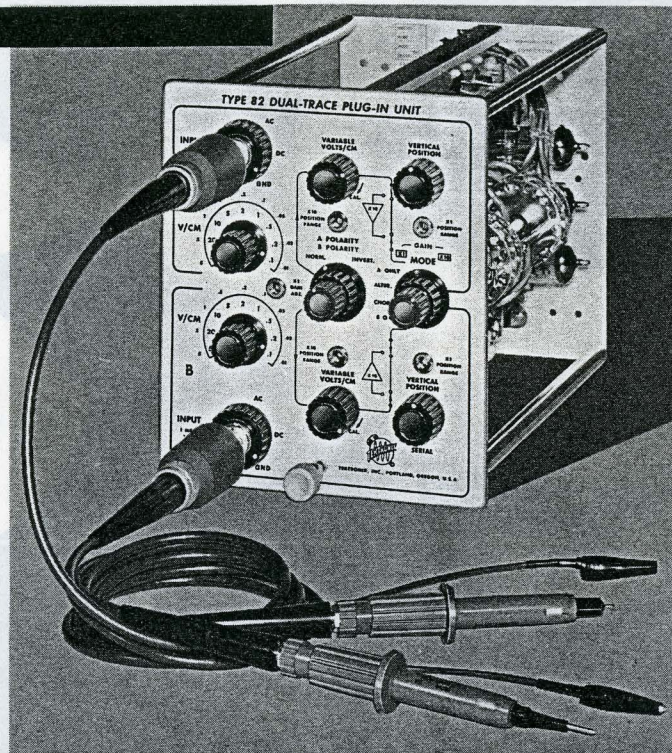


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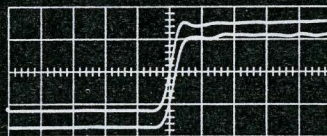
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FROM THE SECTION CHAIRMAN

We are halfway through our fiscal year as a Chicago Section, and have completed our first year as the IEEE. While we have had some problems, in the main there has been significant progress. One area that is being corrected is that of the records and membership. If you have been inconvenienced by late billing or tardy acknowledgement of dues payment, this undoubtedly was frustrating, but it is a phase that should soon be behind us. If by chance there are still some of you who have some special problems, I wish you would call it to our secretary's attention, so we can help resolve it.

I am sure that most of you have had the same experience I have had with our new associates; that is, that they are not only capable engineers, but are most cooperative, with a real desire to make our society outstanding.

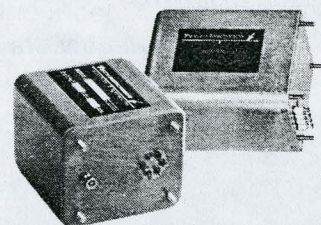
I urge you to make an extra effort to get better acquainted with our many activities by attending our meetings and supporting our activities. I assure you that it will be rewarding. Any of you who attended the Treasure Hunt for the first time had a really enjoyable experience. There are similar programs coming up, so be sure to set aside the dates and plan to participate in them. Also, explore our local technical activities; they will not only be enlightening, but will give you additional opportunities to meet qualified engineers.

The recent National Electronics Conference meeting was an outstanding success, and if you attended the conference, I am sure you were favorably impressed. We had an excellent Section Meeting at McCormick Place during the conference. Fifteen officers and directors of the IEEE attended our pre-meeting dinner, and between 350 and 400 attended a most interesting program.

I will be looking forward to seeing you at our future meetings and activities.

F.M. Scott, Chairman
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CALL FOR PAPERS

1964

Chicago Spring Conference on Broadcast and TV Receivers

The 1964 Chicago Spring Conference on Broadcast and TV Receivers will once again be held at the O'Hare Inn, Des Plaines, on June 15-16, 1964. Papers are sought which will be of significant interest to the home entertainment radio and TV industry. Special consideration will be given to papers dealing with new concepts or new techniques associated with new or improved product design.

By February 17, 1964, potential authors should submit, in triplicate, a summary of 50 to 100 words, including paper title, author(s), company affiliation, and position. Final papers should be limited to 2500 words, and presentation to 20 minutes.

Biographical material will be requested in March, after final paper selection. Final papers, suitable for publication in the PTGBTR TRANSACTIONS will be required at the time of presentation.

Submit papers to: Francis H. Hilbert, Papers Committee, Motorola, Inc., 9401 W. Grand Ave., Franklin Park, Ill.

NOW HEAR THIS . . .

. . . Robert G. Krawczyk, secretary-treasurer of PTGVC, was assigned to the Honolulu office of the Bell system for 8 months, starting in December 1963. Wasn't it clever of Bob to get this assignment just in time to miss winter in Chicago?

. . . Leo Dolkart, historian of the Chicago IEEE, appeared at the Luther High School Career Conference on Friday, November 15. He discussed electrical and mechanical engineering as a career. Career counseling is dear to Leo's heart, as he is a member of the Guidance Committee of the Engineers Council of Professional Development for the State of Illinois.

. . . Semiconductor Specialists, of Chicago, has signed an exclusive franchise agreement with Siliconix, Inc., Sunnyvale, Calif., and Westinghouse Electric Corp., Semiconductor Division, Youngwood, Penna., to stock their products in the Minneapolis-St. Paul, Minnesota area. Semiconductor Specialists will carry the newly developed Siliconix integrated circuits and broad line of field effect transistors and the Westinghouse silicon rectifiers, silicon power transistors, silicon controlled rectifiers, and the OEM industrial series of semiconductor devices.

. . . January 26th is the date! It's SHOWTIME 1964. See John Wayne in "Calculated Risk." Details elsewhere in this issue.

Ruth L. Oldfield
Executive Editor

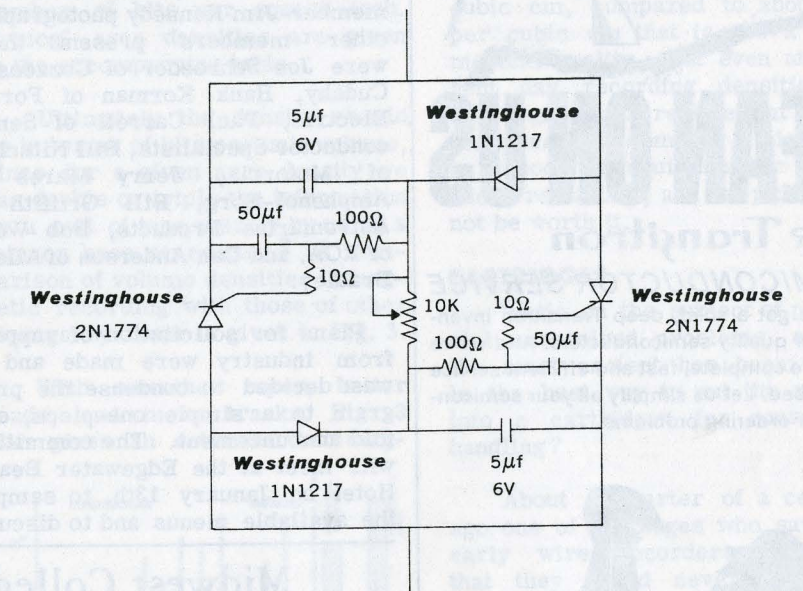
1964

Spring Lecture Series

The Chicago Section, IEEE will sponsor a spring lecture series in 1964, reported Mike Cudahy, Cozzens and Cudahy, publicity chairman of the Lecture Series Committee. The topic will be Solid State Devices and Practical Applications; the papers committee, headed by Amos Turner, Hoyer, Shelesinger, and Turner, is busy reviewing papers in this fascinating field. The Lecture Series Committee, Jack Germain, Motorola, chairman, is completing arrangements for times and place. Mike Cudahy suggests that all interested in the 1964 Spring Lecture Series watch the February issue of ASTRON for full details.

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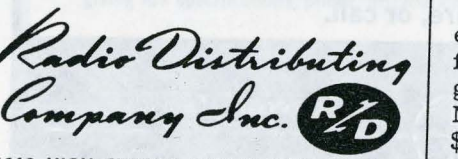
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IEEE Recognition Dinner

Date and Place Determined

The glamorous setting of the Edgewater Beach Hotel has been selected as the scene of the 1964 Recognition Dinner on April 11.

Members of the committee met at Menard's Black Steer Restaurant on November 4th, where committee member Jim Kennedy photographed other members present: these were Joe Schroeder of Cozzens & Cudahy, Hank Korman of Forest Electric, Paul Carroll of Semiconductor Specialists, Bill Nitschke of Motorola, Jerry Mares of Amphenol-Borg, Bill Griffith of Astromarine Products, Bob Wolff of RCA, and Dan Anderson of Allen-Bradley.

Plans for solicitation of support from industry were made and it was decided to condense the program to a simple one-piece, one fold announcement. The committee will meet at the Edgewater Beach Hotel on January 13th, to sample the available menus and to discuss

the entertainment program which has traditionally been the highlight of the Recognition Dinner, now in



IEEE Recognition Dinner Committee. Standing left to right; Joe Schroeder, Hank Korman, Paul Carroll. Seated; Bill Nitschke, Jerry Mares, Bill Griffith, Bob Wolff and Dan Anderson.

its 9th year. Griffith, Anderson, and Schroeder have been members of this committee since 1955. Despite the increased cost of food and entertainment, tickets will be \$9.00, the same as last year; it is estimated that the increased seating capacity of the Edgewater Beach facilities will permit greater attendance.

Midwest Colleges Lead in Research

Most people tend to think of the Midwest as lagging the east and west coast in basic R and D. That this is not necessarily true, at least at the Midwest engineering colleges, is pointed out in the following article. Because the Chicago Section, IEEE, has a stake in promoting the health of the electronics industry in the Midwest, ASTRON will feature articles about NEW electronics and electrical companies here in the Midwest. The first article in this series will appear next month. We welcome your comments on this series and if you know of any new firms we should mention, drop us a line.

Ruth L. Oldfield,
Executive Editor

In dollars spent on research, the top three engineering colleges of the nation are at University of Michigan, Massachusetts Institute of Technology, and University of Illinois.

This is revealed in the 11th edition of Engineering College Research Review published biennially by the Engineering College Research Council of the American Society for Engineering Education. The current issue presents figures for the 1961-62 academic year.

Research reported in colleges of engineering--excluding research foundations or similar separate organizations--totaled \$17,207,000 at Michigan, \$13,100,000 at MIT, and \$11,462,000 at Illinois.

Paul T. Bryant, editor, Journal of Engineering Education and of the "Review" pointed out that increasing

sums are being made available for engineering research. At Illinois, for example, while the 1961-62 figure in the "Review" is \$11,462,000, the total for 1962-63 rose to \$12,262,000. More than 90 per cent of this research is financed by government or industry.

The "Review" gives complete titles for current projects in 126 colleges holding ECRC membership. A subject index helps locate activities in similar fields at different institutions, helping college faculty seeking co-workers in their fields and guiding graduate students and representatives from government, industry and foundations interested in research programs.

The "Review" fills 690 pages. Copies are \$5 from Prof. W. Leighton Collins, executive secretary, ASEE, University of Illinois.

TRENDS IN MAGNETIC RECORDING REAPPRAISAL III

BY MARVIN CAMRAS
IIT RESEARCH INSTITUTE
CHICAGO, ILLINOIS

Increasing the recording density is a perennial favorite sport of tape recording, so it may be of interest to compare the latest score with some of the older ones. In 1951 we plotted the speed of magnetic recording versus the years since 1900. We extended the curve into the future and were able to predict that by 1956 the speed would be very close to zero. Figure 1 shows the predictions of 1951, and the results to the year 1958.

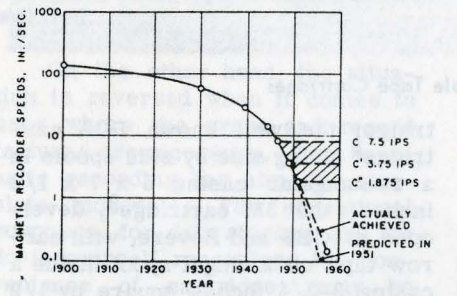


Figure 1. Trend of Magnetic Recorder Speeds (From Ref. 10)

RECORDED DENSITIES

As the art progressed we needed a more refined measure, and it became common to express recorded density in terms of the maximum number of cycles or bits that could be recorded per linear inch of tape. Figure 2 gives an idea of how recorded density has increased through the years. Again there are pitfalls. Some points on this graph represent special laboratory conditions, while others denote easily obtained commercial results.

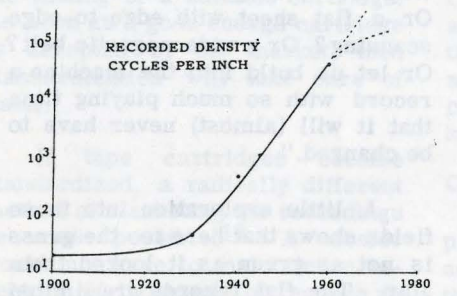


Figure 2. Trend of Linear Magnetic Recorded Densities

With the advent of side-scanned video, and of close spaced multiple tracks, we needed still

another figure of merit in terms of area density of recording: the number of bits per square inch. Typical area densities are given in the accompanying table.

Ultimately the density should be in terms of bits per unit volume, since for a given area density we can double or triple the information on a roll of tape merely by using a thinner base or coating.⁷ A comparison of volume densities in magnetic recording with those of other storage systems is given in Fig. 3.

With smoother tapes, better heads, and more tracks, Fig. 3 also gives an estimate that mag-

netic recording might approach a storage efficiency of 10¹³ bits per cubic cm, compared to about 10⁸ per cubic cm that is now a commercial reality. But even at present day recording densities we are beginning to realize that higher densities will come at a high cost in associated equipment or at reduced reliability, and the price may not be worth it.

CARTRIDGES

While on the subject of perennial unresolved problems, one of the most ancient has been: what is the best way to put the record into a cartridge* for convenient handling?

About a quarter of a century ago one of the sages who saw our early wire recorders remarked that they would never be really practical until the record was magazine-loaded. Since that time

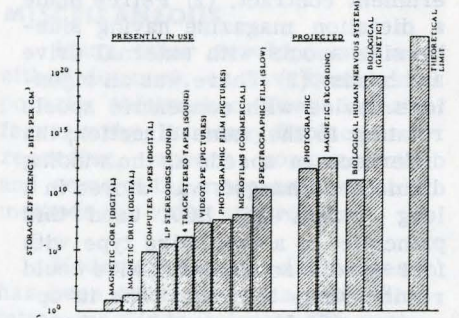


Figure 3. Information Storage Capacity of Common Recording Systems (From Ref. 7)

*The terms "cartridge" and "magazine" are used interchangeably here, though there may be some fine distinctions.

AREA DENSITIES OF MAGNETIC RECORDINGS

YEAR	RECORDER	APPROX. AREA-DENSITY-CYCLES PER SQ. INCH
1937	Vicalloy tape 16 in/sec ¹	10,000
1946	Single track coated tape 7-1/2 in/sec	4,000
1947	Double track coated tape 7-1/2 in/sec	8,000
1947	Spiral track coated disk ²	25,000
1949	Double track coated tape 3-3/4 in/sec	16,000
1953	High speed video recording (RCA) 360 in/sec ³	60,000
1956	Side scanned video tape (Ampex) 15 in/sec ⁴	250,000
1960	Ultra-smooth coated disc ⁵	320,000
1961	Very narrow tracks on coated tape ⁶	1,000,000

MAGNETIC RECORDING

Continued from page 7

hardly a month has ever passed when we did not hear these sentiments repeated by knowledgeable laymen; and I'm sure that Valdemar Poulsen himself, 65 years ago, also had many helpful suggestions that he should use a magazine.

In our group a "magazine committee" was formed. We met regularly and talked about standardizing a magazine for the industry. The main trouble was that no one could think of a suitable magazine. Every proposal seemed to have at least one fault that killed it completely. Some wanted to seal everything in to the magazine except the motor and the amplifier. This was easy, but too expensive. Others thought we should have nothing in the magazine except the record itself; then the machine became complicated. As we kept simplifying the magazine we reached a point where the next major simplification was to remove the shell, and lo, we had completed the cycle and ended up

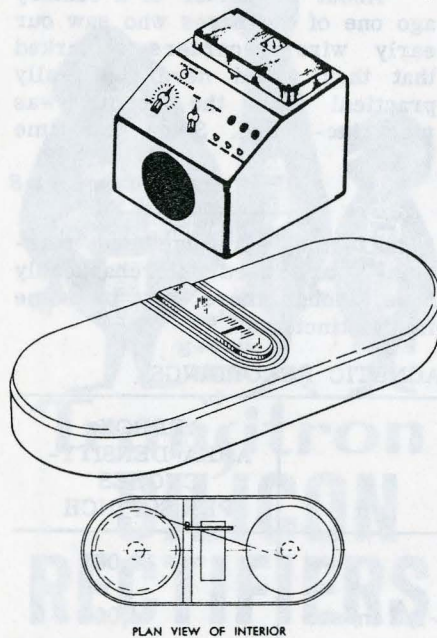


Figure 4. Early A. R. F. Magazine and Magazine Recorder

with a spool again. Figure 4 illustrates one of our early magazine designs; Figure 5 is one of the latest.

To describe the magazines that have been tried would take a volume in itself, and a collection could fill a sizable museum. A few representative types will be mentioned. (1) Brush Development Company made a "complete-ex-



Figure 5. Compatible Tape Cartridges

cept-for-the motor type" on a government contract. (2) Peirce made a dictation magazine having side-by-side spools with external drive and heads. (3) There was an ingenious device with concentric spools rotating in the same direction; the difference in speeds as the winding diameters changed was stored in a long spring. (4) RCA used this principle in a twin wire type with four spools so that one wire could rewind while the other was in operation. (5) Magnecord had an endless tape which they pulled from the bottom of a reel and wound back on top of the same reel. This was later offered in compact form by Mohawk, Cousino, Eash, and others, and is the basis for the NAB Cartridge units that are now popular for broadcast commercials. (6) Magnecord also made an endless tape loop which was stored in random loop fashion in a narrow bin. (7) Armour Research Foundation demonstrated a multitrack endless loop magazine which could play a continuous recording of several hours duration on a relatively short tape. It also showed a mobius loop for further reduction of tape length. (8) The 3M company developed a tape cartridge with concentric spools utilizing tape at 1-7/8 inches per second. (9) Musamatic of France produced a record in the form of a wide flat tape-helix, contained in a pretzel shaped housing.

At the present time, in the U.S.A. there are several versions of the Cousino endless loop car-

tridge; the well known RCA cartridge⁸ using side by side spools in a rectangular casing 5 x 7 x 1/2 inches; the 3M cartridge⁹, developed at CBS and Revere, with narrow tape on a single spool inside a casing 3-3/4 inches square by 1/2 inch high; and the Armour cartridge¹⁰ which is round, 3-3/4 inches diameter by 1/2 inch high.

Automatic changer mechanisms have been made for the last two. All of the above cartridges can be used only on a machine especially designed for them, except the Armour cartridge which will operate also on standard recorders.

After some long agonizing experiences with cartridges, the thought has come to many designers "Why do we need a cartridge at all? Why not a magnetic disc record? Or a flat sheet with edge-to-edge scanning? Or a wide magnetic belt? Or let us build into the machine a record with so much playing time that it will (almost) never have to be changed."

A little exploration into these fields shows that here too the grass is not as green as it looked from afar. The flat records are limited in playing time and/or fidelity. There is a nasty tracking problem which can be solved by putting grooves in the record, but someone will always point out that as long as we are going to press grooves, we

MAGNETIC RECORDING

might as well make a phonograph record. At the other extreme, with an infinite built-in record, we have problems of instant access to a desired recording and of adding new selections when they become available.

It is interesting that in most discussions of cartridges there is a tacit assumption that such cartridges will be used to replace phonograph records. For this purpose the cartridge must be cheap, foolproof, and high fidelity. Similarly for the machine which uses them. Of the many designs which started with these noble objectives in mind, only a few have ended as workable systems. But, so far, the ones which reached the market have turned out to be so noncompetitive that the phonograph industry is not worried.

On the other hand, the situation is reversed when it comes to uses where the erase and record features are necessary. Here magnetic recording has almost a complete monopoly. For educational purposes, for data storage, and for do-it-yourself recordings the convenience of cartridges may be worth the added cost.

It is interesting that in the U.S.A., home recording of radio broadcasts is a relatively minor activity, whereas in Europe it has reached such proportions that legislation is being considered to tax the recorder owners in order to pay the copyright owners of the music.

For at least 20 years there has been a feeling that if we standardized on a cartridge, then the industry would really move. But most of us now realize that the real problem is not standardization but the finding of a suitable cartridge. As soon as a good enough cartridge is accepted by the market, then standardization will take care of itself.

If tape cartridges become standardized, a radically different method of marketing the recordings becomes possible.¹⁰ A dealer would not have to maintain an inventory of thousands of records as he does today. He would simply have some unrecorded cartridges and a few recorders that were connected by telephone lines to a central record library. The customer could select anything in a large

catalog, dial a number, and pay only for the music if he brought his own cartridge. Nothing would ever be out of stock.

MAGNETIC HEADS

Great expectations accompanied the successful demonstration of flux-sensitive heads that were developed in the last decade. These used electron beams, magnetic modulators, and the Hall-effect.¹¹ To date there has been no extensive application of any of these.

Microgap heads with gaps of 0.00005 inches or less are now common. These have excellent playback resolution, but recording is a problem unless very thin tapes are used. The problem may be overcome by recording the low and high frequencies separately.¹² A simpler arrangement is the use of an X-field head. Recently a low-cost design has been made of a four-track X-field stereo head with a built in erasing section.¹³

MISCELLANEOUS

Many other developments are either dormant, or have been temporarily sidetracked. These include ferrography, boundary displacement recording, speech compressors, and some of the more sophisticated methods for video recording.

Moderate commercial success has been attained by magnetic dictation machines, telephone answering devices, eight-millimeter magnetic sound, and stereophony.

On the other hand the fields of data storage (computers), and mechanical (high speed) video recorders have been successful even beyond the hopes of their original advocates.

In all these fields progress in the last few years has been slow and orderly, and is expected to continue in a relatively unspectacular manner; except for home-video recording which may (or may not) have some surprises.

CONCLUSION

Looking back at periods just prior to announcement of major advances in magnetic recording of the past, we noticed that there were no definite foreshadowings of what would take hold next. Therefore our best advice is not to put too much faith in any predictions of this paper. We will continue to expect the unexpected.

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- Eldridge, D. F. and Daniel, "New Approaches to A-C Biased Magnetic Recording", IRE Transactions on Audio, vol. AU-10, p. 72; May-June 1962.
- A Micro-Gap Combined Erase-Record-Playback X-Field Head; Armour Research Foundation Magnetic Recorder Licensee Bulletin No. 115; March 1963.

BIOGRAPHY

Since 1940, as a member of Armour Research Foundation, (now IIT Research Institute) Marvin Camras has done research on projects in the electronics department, including remote control, high speed photography, magnetstriction oscillators, and static electricity.



M. Camras

Camras has contributed developments that are used in modern magnetic tape and wire recorders, including high frequency bias, improved recording heads, wire and tape materials, magnetic sound for motion pictures, multi-track tape machines, and binaural sound reproduction. He is a Fellow of the IRE, of the Acoustical Society of America, AIEE, and AAAS, the author of many articles, holds 250 patents, and received the John Scott medal in 1955 for his work in magnetic recording.

Meet the Staff

GEORGE RAPPAPORT

Dynamic George Rappaport, president of SCANFAX, INC., has long been interested in Section publications. When he was with the Air Force at Wright-Patterson Air Force Base, Dayton, he was instrumental in founding *The Wave Guide*, publication of the Dayton Section, IEEE; later, while in Washington D.C., he worked on the local Bulletin. He thus brings to *ASTRON*, both his wide administrative background and his experience with other section publications. His enthusiasm is tremendous and he has inspired the rest of the staff to greater efforts. The new look of the new section publication, *AS-*



G. Rappaport

TRON, is largely a result of his efforts.

George came to the Chicago area in 1962, when he assumed the presidency of Warnecke Electron Tubes. The Section immediately took advantage of his long experience in IRE affairs, making him membership chairman---a post to which he brought his experience on the national membership committee of IRE. Among his other IRE posts were Director, chairman of PTG on Aeronautical and Navigational Electronics, chairman of PTG on Airborne Electronics; secretary, and then chairman, of the Dayton Section--- the list goes on and on. He is also a Fellow of IEEE.

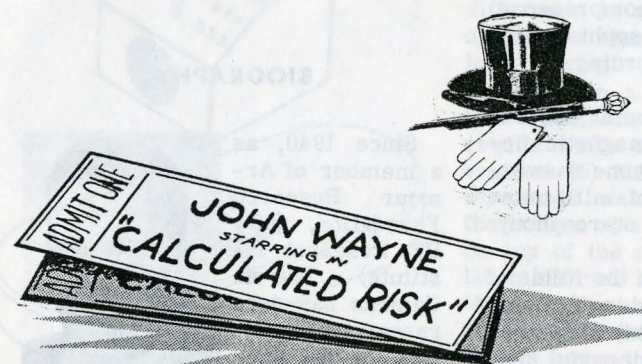
His professional experience is as impressive as his IRE experience. Now president of Warnecke Electron Tubes, he was previously vice-president of Emerson Radio and Phonograph Corporation and also vice-president and assistant to the president of Emertron, Inc., the government and industrial subsidiary of Emerson.

Before that, George was with the Air Force, at Wright-Patterson, from 1944 to 1956, where he was a pioneer in the electronic counter-measures field. Among the civilian positions he held were: Consultant to the Chief of the Weapons Guidance Laboratory, Chief of the Advanced Development Branch of the Radiation Laboratory, and Chief of the Plans Staff.

George received his BS in electrical engineering from the College of the City of New York and his MS in electrical engineering from Ohio State University. He has done additional graduate work at both Ohio State and at the University of Michigan. In addition to being a Fellow of the IEEE, he is also a member of the National Security Industrial Association, Army Ordnance Association, Armed Forces Communications and Electronics Association, U. S. Navy League, and Air Force Association.

All in all, quite a guy---and Chicago and *ASTRON* is lucky to have him with us.

Two Tickets on the Aisle ?



Get your reservations in early for *SHOWTIME* 1964 on Sunday, January 26, 1964. See John Wayne in "Calculated Risk", a comedy about big business. Set in a small town, anywhere in America, this laugh-filled play involves stock transfer dealings.

A juicy roast beef dinner, done just the way you prefer---will be served at 5:00 p.m. at the Martinique Restaurant at 2500 W. 94th Street, Chicago, Ill. Curtain time at the Drury Lane Theater is 7:00 p.m. This perfect end to the holiday season costs only \$6.50 per person for dinner and theater. Get your reservations in early by calling George Spisak, Commonwealth Edison Co., Northern Division, 1000 Skokie Blvd, Northbrook, Ill., at BRoadway 3-3515, ext. 278 or 391. A few tickets are available for the performance of "Calculated Risk" only at \$3.25 each. Tickets for both dinner and for theater on a first-come, first served basis---so get your reservations in to George Spisak today. Make checks payable to Chicago Section, IEEE.

MANUFACTURER'S REPRESENTATIVES IN CHICAGO AREA

Beginning in this issue, *ASTRON* offers its readers a new service---a listing of various manufacturer's representatives in the Chicago area and the product line carried. If you are a manufacturer's representative and are not listed here, call 332-7034 and Sully Gaskins or Patricia Ibbs will be happy to explain how you can obtain such a listing for your organization.

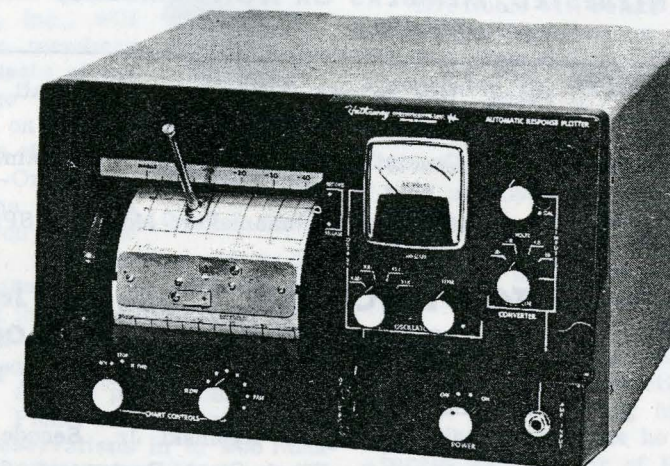
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Here at last is a compact self-contained unit, a complete audio range plotting system. A built-in oscillator generates a 20 - 20,000 cps signal which is fed into the equipment to be tested. Its output is returned (either directly or by a microphone pickup) to the ARP-3 where it is converted into a log form plot. The ARP not only eliminates costly hand plotting methods, yet plots curves too complex to be drawn by hand, such as the response of a loudspeaker in a live room.

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SPECIAL NOTE

Hathaway factory experts will explain and demonstrate the ARP-3 at the Audio Engineering Society on January 8, 1964 at 8:00 PM at ALLIED ELECTRONICS, 100 N. Western Ave., Chicago, Illinois. YOU ARE CORDIALLY INVITED.

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IEEE Meeting Calendar

ALL THOSE INTERESTED, MEMBERS OR NONMEMBERS,
ARE WELCOME

HAPPY NEW YEAR January 1, 1964

PTG ENGINEERING MANAGEMENT Wednesday Jan. 8
6:00 p.m.

"Zero Gradient Synchrotron"

Speaker: R. E. McDaniels, Motorola, Inc.

Place: Menard's Black Steer Restaurant.

Time: Cocktails 6:00 p.m., dinner 6:30 p.m.; meeting 7:00 p.m.

Reservations: Phil Conway, BRoadway 5-1600 by January 6.

CHICAGO SECTION TECHNICAL MEETING Thursday, Jan. 9
7:30p.m.

Place: Western Society of Engineers Building, 84 E. Randolph St., Chicago.

Time: Social hour, 5:30 p.m.; Speakers' dinner, 6:15 p.m.; dinner, \$3.25, including tax and tip; technical papers, 7:30 p.m.

Reservations: Call WSE, RA 6-1736

TECHNICAL PAPERS:

PRODUCT ENGINEERING AND PRODUCTION/COMPONENT PARTS

"Successful Applications of Epoxy Alloys in the Electrical-Electronics Industry"

Speaker: Charles E. Chastain, High Strength Plastics Corp.

COMMUNICATIONS SYSTEMS/SPACE ELECTRONICS AND TELEMTRY/TECHNICAL COMMITTEE ON COMMUNICATIONS

"Applicability of Space Division Switching Technique to the Solution of Current Switching System Problems"

Speaker: Edward J. Leonard, ITT-Kellogg

TECHNICAL COMMITTEE ON POWER

"The Modern Engineering Curriculum---Educator vs. Employer"

Speakers: Dr. W. A. Lewis, Illinois Institute of Technology; John F. Bracken, Commonwealth Edison Company; John Alger, Hotpoint Division, General Electric Company.

CHICAGO SECTION GENERAL MEETING Thursday, Jan. 16
6:30p.m.

"Electronics of the Future---or a Few of the Things We Don't Know About"

Speaker: Dr. Daniel E. Noble, Motorola, Inc.

Place: Ray Foley's Restaurant at the Hyatt House, Lincoln and Touhy Aves., Lincolnwood, Ill.

Time: Cocktails, 5:30 p.m.; dinner 6:30 p.m.; cost, \$4.75.

Reservations: Bob Nunamaker, Motorola, SPaulding 2-6500, ext. 255.

PTG VEHICULAR COMMUNICATIONS Tuesday, Jan. 14
6:00p.m.

"Design of Mobile Telephone Systems During Transition to IMTS"

Speaker: Chandos A. Rypinski Jr., Secode Corp.

Place: Menard's Black Steer Restaurant, 6446 W. North Ave., Chicago, Ill.

Time: 6:00 p.m.

Reservations: Call John Brattin, Motorola, Inc., SPaulding 2-6500, ext. 510 by January 13.

CALUMET SUBSECTION TOUR Monday, Jan. 20
3:30p.m.

Tour of Ford Motor Company Stamping Plant

Place: Ford Motor Company Stamping Plant, Cottage Grove Ave. and Route 30, Chicago Heights, Ill.

Time: Tour Starts at 3:30 p.m.

Dinner: 6:30 p.m. at Teibel's Restaurant, Routes 30 and 41, Ill.

Reservations: Call SAginaw 1-4980, ext. 2517, or EXport 8-2000, ext. 2517, before January 16, 1964.

Tour limited to 50 people. First come; first served.

SHOWTIME 1964 Sunday, Jan. 26

"Calculated Risk"

Starring: John Wayne

Place: Martinique Restaurant and Drury Lane Theater, 2500 W. 94th Place, Chicago.

Time: Dinner, 5:00 p.m.; Curtain, 7:00 p.m.

Cost: Dinner and theater, \$6.50 per person; theater only, \$3.25 per person.

Reservations: Send checks, made out to Chicago Section IEEE, to George Spisak, Commonwealth Edison Company, Northern Division, Northbrook, Ill. Phone number, BRoadway 3-3515, ext. 278 or 391.

FOX VALLEY SUBSECTION Wednesday, Feb. 5
6:30p.m.

"Motor Controls"

Speaker: Dudley Blake, Furnas Electric Co.

Place: Holiday Inn, North Aurora, Ill.

Time: Dinner, 6:30 p.m.

Tour: Furnas Electric Co. plant following meeting

Reservations: Ray Lies at 627-5500, ext. 231 by Monday, February 3.

SECTION MEETING, JANUARY 16, 1964

Electronics of the Future

Daniel E. Noble, Executive Vice-President of Motorola, Inc., will talk to members and guests of the Chicago Section IEEE on "Electronics of the Future---Or a Few of the Things We Don't Know About".



Dr. D. E. Noble

The meeting will be held once again at Ray Foley's Restaurant in the beautiful Hyatt House, Lincoln and Touhy Avenues, Lincolnwood. Cocktails at 5:30 p.m.; dinner at 6:30 p.m.; cost, a mere \$4.75. Plenty of free parking. Get your reservations in to Bob Nunamaker, SPaulding 2-6500, ext. 255, by January 14 for this important meeting.

Paced by the new scientific revolution, the electronics industry is undergoing profound changes. The swing from component orientation to materials orientation for the construction of functional electronic equipment is well underway, and the rising use of integrated circuits will change not only the face of industry but the patterns of education and of our scientific culture as well. The advanced forms of communications through the use of information processing and computer brain extension systems may be the only hope for the rationalization of the rising complexity of democratic governmental proce-

dures and for the ultimate relief of world tensions.

Dr. Noble will relate the potential creative contributions of electronics engineering to the problems generated by the rapid changes in our modern culture. He will discuss the influence of the new electronics art upon industry in particular and upon our changing culture in general. Dr. Noble believes that while we may not know precisely where we are going, we can establish trends and possible directions.

Daniel E. Noble taught at the University of Connecticut for 17 years before losing his amateur standing at the time he joined Motorola as Director of Research in 1940. While at the University he pioneered work with FM and designed the first FM communication system for three-way communication for the Connecticut State Police. After joining Motorola in 1940, he directed the development of Motorola's line of FM mobile communications equipment. He advanced through the positions of General Manager of the Communications Division, to Vice-President, to Director, and on to his present position of Executive Vice-President in charge of the four technical products divisions of the corporation: the Communications, Semiconductor Products, Solid State Systems, and Military Electronics Divisions.

In 1948, Dr. Noble opened a research laboratory in Phoenix to

start Motorola technical activities in the solid state electronics field. The Korean war support assignment delayed concentration upon this work, but after the war developments were started in the areas of semiconductor devices, electronics ceramics, and thin film circuitry. The Phoenix establishment now employs between 7500 and 8000 people, and Dr. Noble has been concerned with all phases of the technical products divisions, including research, development, production, and sale of the equipment.

Dr. Noble did his undergraduate work at Connecticut State College (now the University of Connecticut), and graduate work at both Harvard University and Massachusetts Institute of Technology. Dr. Noble has been chairman, and member, of many technical and advisory committees, including the Radio Technical Planning Board and the National Color Television Systems Committee. He is also a member of the Army Scientific Advisory Panel, a fellow and director of the IEEE, and a director of the Arizona State University Foundation. In 1962 he received the Western Electronics Manufacturers Association Medal of Achievement for his accomplishments as a "scientist, business executive, educator, and civic leader." He holds several patents and has written extensively, not only technical articles but also papers dealing with the problems of development of effective, reliable military electronics equipment.

TECHNICAL MEETING, JANUARY 9, 1964

The regular Technical Meeting of the Chicago IEEE will be held on Thursday January 9, 1964 at the Western Society of Engineers Building, 84 E. Randolph Street, Chicago. Social Hour, 5:30 p.m.; dinner, 6:15 p.m.; meeting, 7:30 p.m. Cost of dinner \$3.25, including tax and tip. For reservations call WSE at RA 6-1736 by Tuesday, January 7, 1964.

PRODUCT ENGINEERING AND PRODUCTION/COMPONENT PARTS

APPLICATIONS OF EPOXY ALLOYS IN THE ELECTRICAL-ELECTRONICS INDUSTRY

On January 9, Charles E. Chastain, High Strength Plastics Corp., will describe some of the epoxy alloys currently used in the electrical and electronics industry. Unlike the raw epoxy material, epoxy alloys are blends of ingredients designed to satisfy particular requirements, just as metal alloys are designed to exhibit particular characteristics. By adding to or altering the composition of a basic



C. E. Chastain

epoxy, system requirements within a particular range may be filled. Epoxy alloys are widely used---more than 200 different epoxy alloy systems have been developed and are in use by various companies. These systems, applications, and various processing methods will form the basis of Mr. Chastain's discussion. In particular, he will describe basic properties of epoxy alloys, selection of the proper epoxy, equipment and methods for production application, necessity for technical assistance, tooling

Continued on page 14

TECHNICAL MEETING *Continued from page 13*

epoxy alloys, and application methods for prototype development and limited production.

Charles E. Chastain is president of High Strength Plastics Corp., Chicago, a manufacturer of epoxy

COMMUNICATIONS SYSTEMS SPACE ELECTRONICS AND TELEMETRY TECHNICAL COMMITTEE ON COMMUNICATIONS

APPLICABILITY OF SPACE DIVISION SWITCHING TECHNIQUE TO THE SOLUTION OF CURRENT SWITCHING SYSTEM PROBLEMS

Edward J. Leonard, ITT-Kellogg, will discuss new switching techniques on January 9, 1964.

Mr. Leonard is currently product executive--switching of ITT-Kellogg, and was previously director of the switching systems department and was then responsible for the research, development, engineering, manufacture, and installation of solid state and electromechanical switching systems and products.



E. J. Leonard

He was one of the leaders in the ITT-Kellogg development and design of ground communications, in-

TECHNICAL COMMITTEE ON POWER

THE MODERN ENGINEERING CURRICULUM EDUCATOR vs EMPLOYER

Necessary changes in the engineering curriculum, from the viewpoint of both the engineering educator and the employer of engineering graduates. Dr. W. A. Lewis, Illinois Institute of Technology, will present the viewpoint of the engineering educator and John F. Bracken, Commonwealth Edison Co., and John Alger, Hotpoint Division of General Electric, will represent employers, who may be viewed as the "consumers" of the products of the engineering schools.

Dr. W. A. Lewis is a research professor of electrical engineering at Illinois Institute of Technology. He received his engineering preparation at the California Institute of Technology, where he received a BS in electrical engineering with honors in 1926, an MS in electrical engineering with honors in 1927, and a Ph.D. summa cum laude in 1929. He was a central station engineer with Westinghouse from 1929 to 1939 and from 1931 to 1938, also Westinghouse Lecturer at the University of Pittsburgh. He became director of the school of electrical engineering at Cornell University in 1939, leaving to go to Illinois Institute of Technology in 1944. At IIT, he was dean of the graduate school from 1946 to 1955.

John F. Bracken started with Commonwealth Edison Company in 1925 in the testing department, where he

alloy systems and chemically resistant coatings. In the past eight years, he and his company have conducted workshops and seminars on epoxy alloy systems at more than 1000 different companies. Mr. Chastain is a member of SPE, ASTM, and ASTM.

dustrial remote control, and automation and data handling systems. Previously, he was manager of the missiles systems engineering department and was responsible for ITT-Kellogg's activities in the Atlas and Titan missile programs.

Mr. Leonard, who holds 13 patents in the automated communications field, also directed engineering activities for the SAC communications and control systems 465L and for other major military and non-military systems.

During his service in the United States Army Signal Corps, he supervised the design, construction, and installation of wire communication equipment and PBX equipment for the Twelfth Army Group.

worked four summers on special electronics projects. After graduation from the University of Illinois in 1929, he started with Commonwealth Edison in the student training program and was subsequently assigned to the bureau of specification. In 1932, he was transferred to the design division; and in 1938, to the plant engineering department.

During World War II, John was an officer in the U.S. Navy, in electronics, with most of his time spent at MIT. After the war, he rejoined Commonwealth Edison in the station design department, where he ultimately became assistant department head.

After several brief tours in various operating areas, he was made staff assistant to the operating manager and in 1958 was appointed department head of the newly created distribution-engineering department.

He is a member of the IEEE, the Edison Electric Institute, and the Association of Edison Illuminating Companies.

John Alger is an engineer with the Hotpoint Division, General Electric Company, Chicago.

MEETINGS AHEAD

PTGVC Meets January 14

The PTG on Vehicular Communications will gather at Menard's Black Steer Restaurant, 6446 W. North Ave., Chicago, at 6:00 p.m. on January 14, 1964, to hear Chandos A. Rypinski Jr. discuss the "Design of Mobile Telephone Systems During Transition to IMTS". For reservations, call John Battin, Motorola, SP 2-6500, ext. 510.



C. A. Rypinski

Although the Bell telephone system has now adopted a technique for mobile telephone service, this technique will be adopted as a national standard only if it can be proved to non-Bell users to be both economical and feasible. Adoption of this standard will be possible only after proper secondary equipment is available.

Any successful mobile service must recognize the inherent roaming characteristic of motor vehicles, yet operate at reasonable cost. Design of such a system must take into account not only newly available equipment but also the extensive existing plant and the possibility of future developments. Although the IMTS (Improved Mobile Telephone Service) development stipulated manual compatibility, the serious limitations of this mode of operation must be understood and excessive reliance on it should be avoided. Also, the effects in metropolitan areas of a substantial roaming population, and its effect on channel utilization, must

be considered. IMTS logic makes possible techniques not used before, in the siting of base stations, the use of satellite bases and receivers, and the application of busy cross strapping.

The State of Illinois illustrates problems encountered in the design of such a mobile system. In the Chicago area, the greatest possible service must be obtained from each particular channel. In rural areas, however, the problem is different, and equipment compatible with the metropolitan system must not penalize these thinly populated areas. Mr. Rypinski will show that, using new techniques and new equipment, the IMTS system is suitable for a standard both outside the Bell system and also in areas of low population density.

Chandos A. Rypinski Jr. dates his experience in radio communication from 1938, when he obtained a ham license and operated W6RDR. He obtained both his radiotelephone first class operator's license and his radiotelegraph second class operator's license in 1942.

After serving in the United States Marine Corps as a staff sergeant from 1943 to 1946, Mr. Rypinski received a BS degree in 1948 from the California Institute of Technology. He has had a distinguished career in the field of mobile communications both with the western division of Collins Radio Company and with Consolidated Electro-Dynamics Corporation.

He organized the C. A. Rypinski Company in 1957 and, after merger with Secode Corporation in 1960, became engineering vice-president of Secode. In December 1960, Mr. Rypinski proposed the application of a marked idle channel technique

to a two-way dial, automatic channel selection mobile radio system. Many of the concepts he proposed in this paper were later incorporated into Secode's sponsored development of the non-radio mobile equipment for the Bell IMTS system, now being put into operation. Mr. Rypinski and his associates at Secode have made substantial contributions to the development of the logic for this system.

He holds a number of US patents and has other applications pending. A resident of Tiburon, California, he sails a boat on San Francisco bay when not designing mobile telephone secondary equipment.

PTGEM Meets January 8

The design and construction of a modern high energy particle accelerator requires the team effort of many scientists and engineers. Solutions to interrelated problems require knowledge of high vacuum techniques, magnet design, generation of pulsed high power RF signals, accurate timing and measuring devices, and the control and switching of high power.



R. E. McDaniel

The Zero Gradient Synchrotron, a high energy accelerator producing a 12.5 Bev proton beam, was recently completed by the Particle Accelerator Division at Argonne National Laboratory. The organization of this Division and the characteristics of the major components in the accelerator will be described by Mr. R. E. McDaniel of the Division on January 8, 1964. Meeting at Black Steer Restaurant; call Phil Conway.

CALUMET SUBSECTION TOUR

Members and guests of the Calumet Subsection will tour the Ford Motor Company Stamping Plant in Chicago Heights, Ill., on Monday, January 20, 1964. Tour starts at 3:30 p.m. at the plant, Cottage Grove Avenue and Route 30.

A representative of the Ford Motor Company will guide the group through this newest plant of the stamping division. Production began at this plant in September 1956. The plant manufactures metal parts, formed by pressing sheets of steel into predetermined shapes. These stampings are shipped to Ford's

final car and truck assembly plants throughout the United States and Canada. Automation is widely used to provide safer operations and to ease handling of materials by employees.

The electrical system of this plant will be the subject of the meeting to be held at Teibel's Restaurant, Routes 30 and 41, Illinois. Dinner at 6:30 p.m.; choice of beef or chicken, family style for \$3.75. Tour is limited to 50, so call Saginaw 1-4980, ext. 2517, or Export 8-2000, ext. 2517, before January 16, 1964, to be sure of a reservation.

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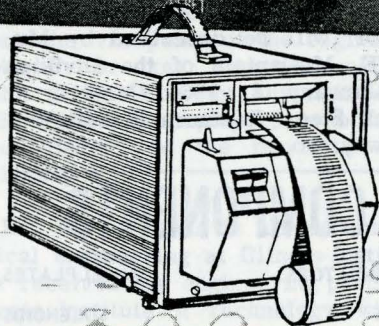
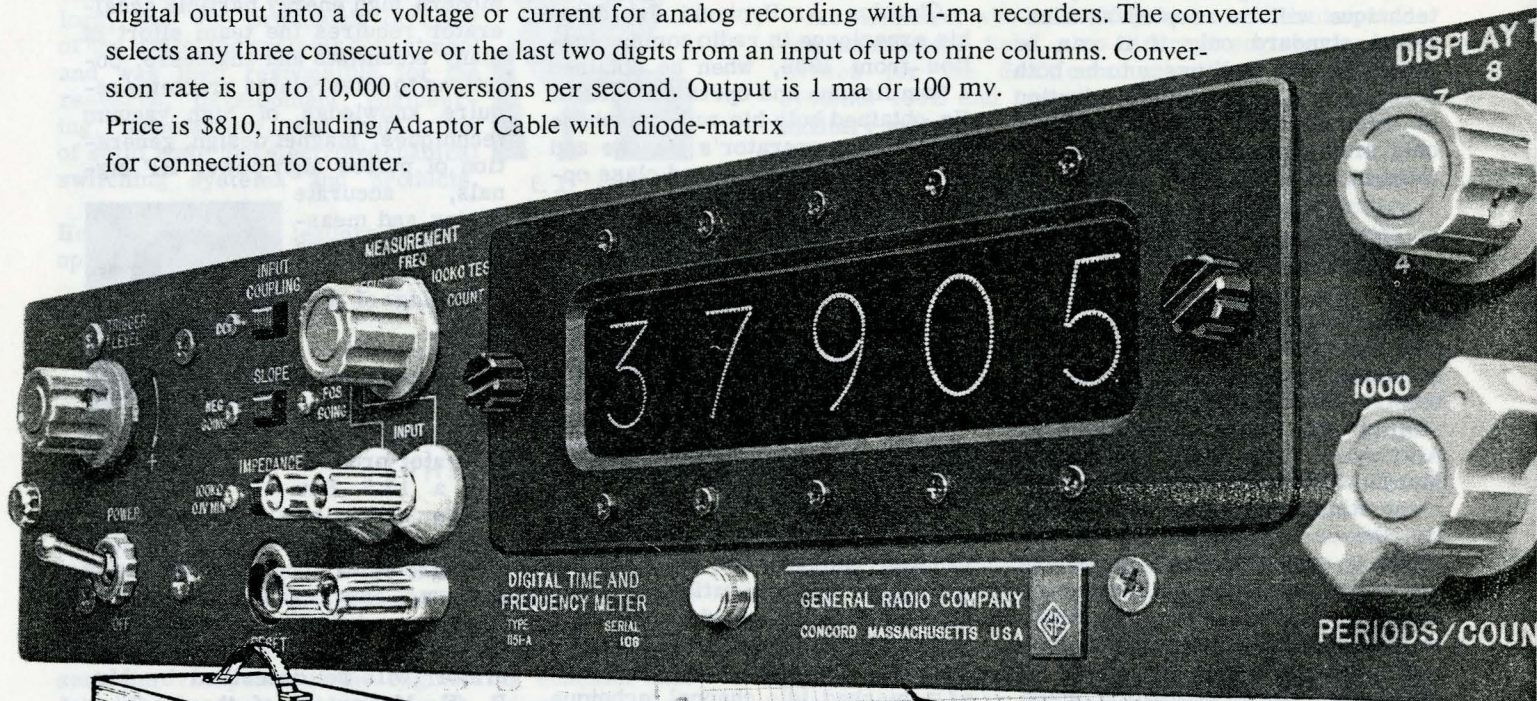


The 1151-A has a full complement of input controls permitting selection of trigger level, ac or dc coupling, and sensitivities of 1 volt at 1 megohm or 0.1 volt at 100 kilohms. In addition to frequency measurements and counting over a range of dc to 300 kc, the 1151-A will also measure periods to 20 kc and frequency ratios. Accuracy is ± 1 count $\pm$ crystal oscillator stability. Short-term oscillator stability is better than $\frac{1}{2}$ ppm. Readout is provided by easy-to-read, bright, in-line Numerik indicators. Two models are available: the Type 1151-A, \$1195, and the Type 1151-AP which has outputs to drive an auxiliary Data Printer or a Digital-to-Analog Converter, \$1250. Also available is the 1150-A at \$995, to measure frequency only.

Digital Recording — The 1137-A Data Printer provides the means for recording decimal coded information from the 1151-AP. The Printer has a 5- to 12-digit capacity and operates at printing rates up to 3 prints per second. Price, bench model, \$1350; rack model, \$1400.

Analog Recording — The Type 1136-A Digital-to-Analog Converter translates the counter's digital output into a dc voltage or current for analog recording with 1-ma recorders. The converter selects any three consecutive or the last two digits from an input of up to nine columns. Conversion rate is up to 10,000 conversions per second. Output is 1 ma or 100 mv.

Price is \$810, including Adaptor Cable with diode-matrix for connection to counter.



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