
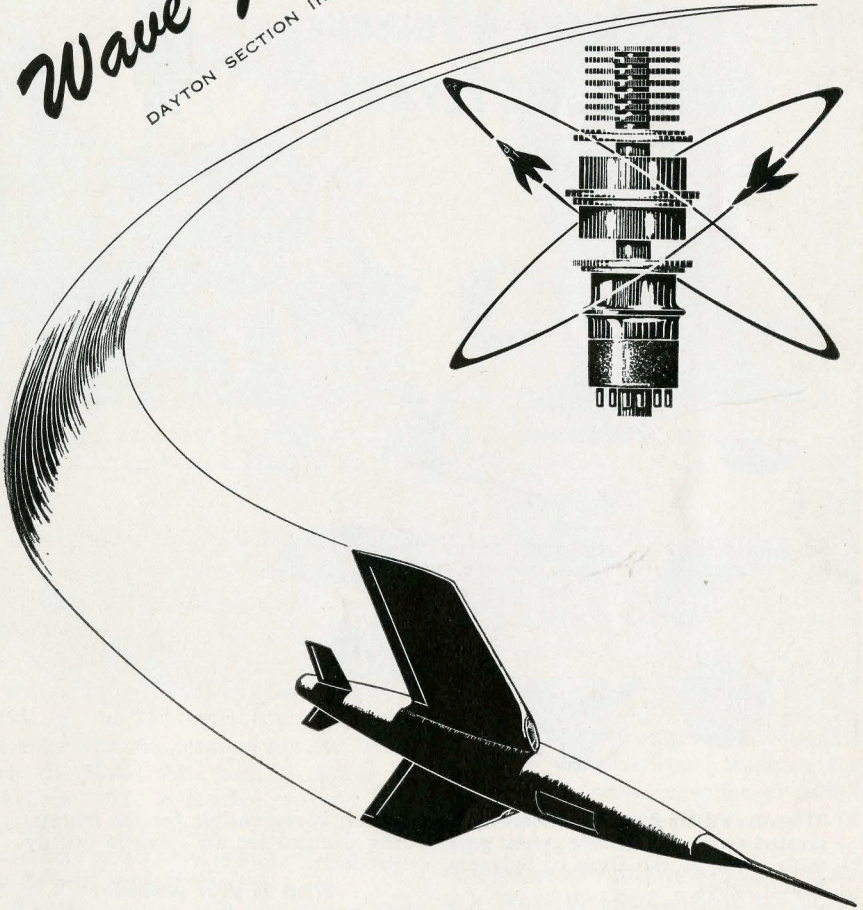


SEPTEMBER

1952

  
*Wave Guide*  
DAYTON SECTION IRE



The Dayton Section, IRE, invites you to attend the  
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**THURSDAY, SEPTEMBER 11, 1952 — 8 O'CLOCK**

*"How Useful Is Correlation?"*

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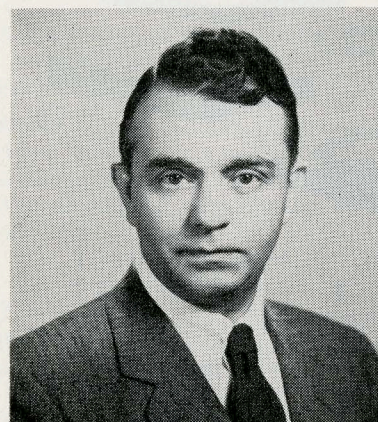
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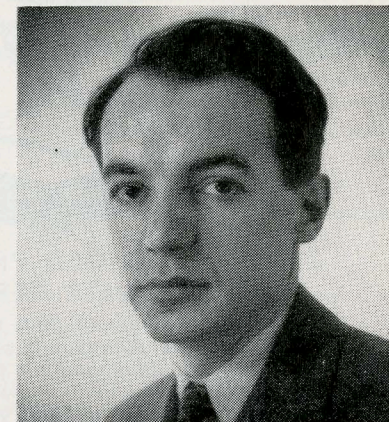
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## Debate on Correlation Scheduled For September Meeting



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Federal Telecommunications  
Laboratory



**WARREN D. WHITE**  
Airborne Instruments  
Laboratory

Opening the 1952-1953 season of technical papers to be presented to the members of the Dayton Section, IRE, is a meeting featuring a debate on the topic, "How Useful Is Correlation?" The meeting is on Thursday, September 11, 1952, at the Engineers Club. The two speakers on the program are Mr. Warren D. White, AIL, and Mr. Louis A. DeRosa, FTL. A similar program was presented previously by these two speakers to the Long Island Sub-section, IRE, with marked success.

The Proceedings, IRE, for October 1950 carries a paper in which the Correlation Function is discussed as follows: "Practical application of the recent developments in communication theory based upon the statistical concept of information has necessitated the study of characteristic functions of actual messages and noise as random processes and the development of techniques for their experimental determination. A statistical characteristic of messages or noise which has shown considerable effectiveness as a tool in the analysis of some communi-

cation problems is the correlation function. The theory (correlation analysis) is supported by experimental results which have been obtained from an electronic correlator."

To stir up discussion from the audience, Mr. White will take the stand that "correlation is not a new technique but is merely a sophisticated language for dealing with noise reduction circuits." Mr. DeRosa on the other hand will show that this language results in a new perspective which frequently leads to a better understanding of the problem and as a result, improved equipment design. In a letter to Mr. Miles McLennan, who made the original arrangements for these speakers, Mr. White invites members of the Dayton Section who are interested in this subject to "come prepared to heckle."

Mr. DeRosa began his career as an engineer with the DeForest Tube Company, Newark, New Jersey, in 1931. Prior to this he had obtained his B.S.E.E. and performed graduate work

(Continued on Page 9)



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### WAVE GUIDE

Vol. 4 September, 1952 No. 1

A Publication of the Dayton Section,  
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## Circular Modes

By JAMES DeLUNA

We are happy to report definite progress in the publication of Wave Guide for the coming season. Circulation has increased to over 2000—25 percent going to the Dayton area and 75 percent distributed throughout 35 states and three foreign countries. An increase to nine pages in advertising has resulted in a 20-page monthly publication. Editorially, the same staff will serve you each month with the addition of Mrs. Schram as editor for "Ladies Only." Florence Schram, incidentally, is the wife of the president of our 1953 Conference on Airborne Electronics.

Your attention is invited to the pictures on page 17. They are proof positive that your executive committee has been on the job all summer. As an excuse to call a meeting, Jim Dennis invited all committee chairmen to a picnic at Hills and Dales and then called the meeting to order right then and there. The only members absent were Brother Louis Rose and Joe General.

### DAYTON SECTION, IRE, 1952-53

Your Dayton Section officers, committee chairmen and members have been active this summer in the planning and preparation for the 1952-53 season. The monthly meetings and technical sessions are to be supplemented by several social affairs (number and type to be determined as based on your expression of interest). A television program in October will be co-sponsored with DATEC and tentative plans have been made for a second TV presentation just prior to the National Conference on Airborne Electronics next May. The Conference will again be jointly sponsored with the IRE Professional Group on Airborne Electronics. Currently in the final stages of formation is a Sub-section at the U.S. Air Force Institute of Technology at Wright Field. In case you hadn't heard, IRE Headquarters has authorized formation of professional group chapters within the various section organizations. Major Maurice Jacobs has accepted the task of submitting a petition and establishing the first such chapter on airborne electronics. Others under consideration are Audio and Industrial Electronics.

One point that I would like to make at this time is in regard to you, the individual members of the Dayton Section. The Dayton Section exists to serve you. When you have an idea as to what we could do to improve the Dayton Section operations, please make the effort required to let one of the officers or committee chairmen know about it. There are a number of positions yet to be assigned in connection with special functions, professional group chapters, and Stuart Schram has a few spots open on the committees for the Conference on Airborne Electronics.

*James L. Dennis,*  
Chairman, Dayton Section  
Institute of Radio Engineers

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## FOR LADIES ONLY

By FLORENCE SCHRAM

I sit here, staring at the typewriter . . . with no inspired thoughts, the temperature in the nineties, the humidity something almost unbearable, but I am admiring my hands. That's what our vacation did for me, for one thing. My hands no longer resemble a charwoman's. No cooking and no dishwashing for two weeks have almost transformed me.

My hands have that velvet texture you hear about in the radio commercials. Any further resemblance to Cinderella is strictly "before." I have circles under my eyes, the result of loss of sleep since I now find it necessary to rise at five in the morning in order to feed the latest addition to the family, a seven-week-old Cocker, nameless at present, but unofficially referred to as "Yappy."

Seriously though, I have never experienced a more thoroughly refreshing holiday. The chance to get away from Dayton's humidity and enjoy the climate of New England was a welcome one. Especially for me, since it was a first trip, my only other acquaintance with that part of the country having been made through the study of geography about umpteen years ago.

Our trip, by air, took us through much of New York, and north to Halifax. We were fortunate in that the weather was ideal. And I must admit that I really enjoyed the trip, though, far from sharing my husband's enthusiasm for flying, I always take off with a resigned feeling, apprehensive, and almost certain that we will end up with our names in the vital statistics column.

The scenery was something we really appreciated. Coming from Michigan, we are used to lakes, and miss them here in Ohio. But it was fun hearing the children exclaim about the mountains. Seen from the ground they were per-

haps majestic, but, from the air, the ridges resemble some hulking prehistoric monsters, huddled together as in sleep.

We found it delightfully warm in the daytime, and cool in the evening at Halifax. I was surprised to discover it was warm enough for swimming every day. We found the food in Canada excellent, and quite moderate in cost. Everyone at our hotel seemed so interested in the political conventions in our country.

We read two good books this summer. One was Mary McCarthy's "Groves of Academe" and the other Godfrey Blunden's "Time of the Assassins." I think that I can truthfully say that Mary McCarthy's book was one of, if not the best, books I have read in recent years. With the children home from school it seems I have little time for reading. It is something of an accomplishment to snatch time out for the magazines and newspapers.

The new Gourmet is here and I have skipped through it. There is an article entitled "Mr. Octopus and Mr. Squid." Frankly, I've been unaware that the octopus is considered a delicacy by some people. The article contains a number of recipes, all beginning "Clean and wash a young octopus." UGH! The meat is described as resembling lobster in taste. Which reminds me that lobsters were obtainable in Halifax at the incredible sum of ten cents each!

Friends in Canada tell about a chap who bought a trailer, but in the course of traveling, had to replace the rear of his Cadillac three times, because of the amount of wear. Repair was so expensive that he bought a Mack truck, installed all of the equipment originally in the trailer, and now tows the Cadillac.

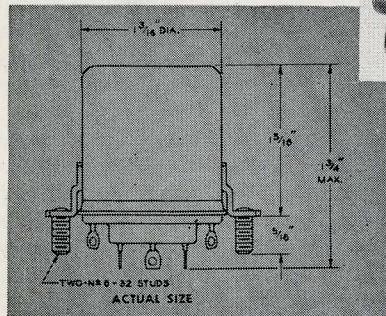
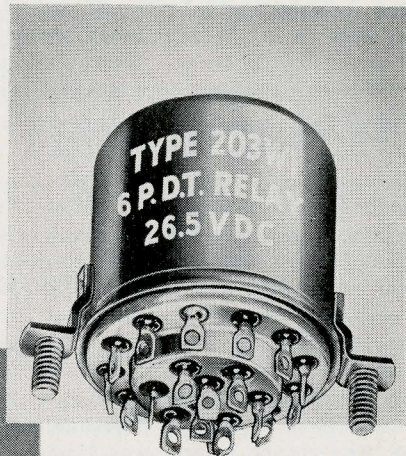
Almost time to get the children ready for school again. Happy schooldays to all you mothers!

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## DEBATE ON CORRELATION--

(Continued from Page 3)

at Polytechnic Institute of Brooklyn. In 1932, he was employed by Electrad, Inc., New York, as a research engineer in radio components, receivers and amplifiers. He was made chief engineer for Electrad in 1936 and one year later became Chief Engineer for Electrad Division of The P. R. Mallory Company in Indianapolis, Indiana. From 1939 until 1942, he was a staff engineer for Electronics Research Labs of The National Cash Register Company, Dayton, Ohio. From there he transferred to his company of present affiliation, where he is now Division Head for Aerial Navigation and Direction Finders.

Mr. White received his B.S.E.E. from

the Missouri School of Mines in 1938. He spent two years employed by John Barron, a consulting engineer in Washington, D. C., and then from 1940 to 1942 was a member of the General Engineering Department of the Columbia Broadcasting System. In 1942 he joined the staff of the Radio Research Laboratory at Harvard University and remained there until 1945. After a brief return to CBS, he was employed by the Airborne Instruments Laboratory, Mineola, New York, where he is now a member of the Radar and Air Navigation Group.

Prior to the meeting, which will be opened by the new section chairman, James L. Dennis, at 8 o'clock, a film entitled "Jet Propulsion" will be shown. As usual, refreshments will follow the close of the evening program.

# MAGNETIC TAPE VIBRATION RECORDING AND ANALYZING EQUIPMENT

By C. B. PEAR, JR., F. W. KENNEDY, T. C. G. WAGNER, AND G. L. DAVIES (The Davies Laboratories, Inc., Riverdale, Maryland)

In the study of aircraft vibration, there arose a need for a relatively small, lightweight recording device, capable of accepting a number of input signals directly from standard vibration pick-ups without external amplification. In addition, playback facilities were required for duplicating the electrical signals of the vibration pick-ups and for Fourier analysis of these signals. To fill this need, magnetic tape recording and playback equipment has been developed, the playback equipment incorporating an automatic harmonic analyzer. Overall system voltage accuracy was desired to be 5 percent, distortion 5 percent or less, analyzer bandwidth from  $\frac{2}{3}$  cps to several cps, dynamic range 40 db, frequency range 3 to 2000 cps, and frequency accuracy of  $\frac{1}{2}$  percent. The very low frequencies involved dictated the use of a carrier system and FM was chosen to eliminate tape characteristics as completely as possible.

The recorder was designed to provide twelve channels for vibration signals and one channel for a tachometer signal; to be remotely controlled; and to operate from the usual 22-28 volts DC source. A fourteenth channel on the tape carries a crystal-controlled reference signal for controlling tape speed on playback. To keep the size and weight at a minimum, a governor controlled DC motor is used to drive the tape and reliance placed on a playback servo to duplicate the recording speed and thus reproduce frequencies. The recording heads are cast in a single

block of plastic and the gaps are accurately aligned at right angles to the direction of tape travel. A separate head is used for each channel and careful shielding between the heads reduces interchannel cross-talk to a level 60 db below maximum signal. This arrangement results in tape  $1\frac{3}{4}$  inches wide.

With a specially designed recording oscillator, using one pentode and a triode (as a buffer and to furnish ample signal to drive tape to saturation at all times), it was possible to achieve  $\pm 20\%$  deviation, at a center frequency of 10 kc, with 1 v maximum input signal applied directly to the modulator. Subminiature tubes were used and each oscillator plugs into a receptacle in the recorder. Two adjustments are provided, one for center frequency and one for deviation sensitivity, on each oscillator.

Linearity of frequency deviation versus modulating voltage is so good that we have not been able to measure it.

The playback system, mounted in three standard 6-foot relay racks, includes a tape transport mechanism; servo for tape speed control; 14 playback channels, each comprising a limiting amplifier and discriminator; harmonic analyzer oscillator; two analyzer filter channels; two 10-inch strip chart recorders; calibrating panel; voltmeter; and power supplies.

To control the tape speed during playback, so that it duplicates the recording speed, the reference channel signal is supplied to a discriminator whose DC output controls the frequency of a 60 cps oscillator, which is of the same design as the recording oscillator.

The oscillator output is amplified and drives the hysteresis synchronous capstan motor. In order to force this system up to a speed within the control range the DC voltage applied to the 60 cps oscillator is limited so that the oscillator frequency never drops below a minimum value within the control range. Thus as soon as the equipment is turned on the capstan motor comes up to its minimum speed the output of the reference channel then produces a control voltage which increases the speed, and the system locks on the correct playback speed.

The output for each playback head, including the reference, is fed through a limiting amplifier to a cycle-counting discriminator. The discriminator outputs for the signal channels include the signal itself plus a spurious output which represents the residual tape speed flutter not compensated by the servo, while the reference channel discriminator output is the residual tape speed flutter only. This latter signal is reversed in phase and then added to all other channels, thus cancelling the major portion of the spurious signal. All signal outputs are available at cable plug receptacles on the front panels at a level duplicating the inputs to the recorder.

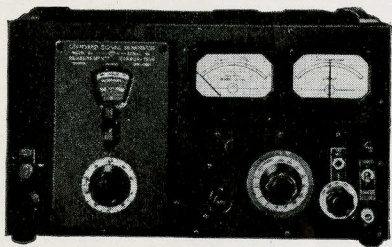
The harmonic analyzer uses the heterodyne principle, the IF frequency being 3000 cps. This type of analyzer has a constant bandwidth in cps, and may be difficult to use and give erroneous indications at higher harmonics of an unstable exciting frequency. On the other hand, the constant percentage bandwidth type of analyzer tends to

produce the same difficulties at the low frequencies, where the bandwidth in cycles becomes very small. The best compromise seemed to be the heterodyne type with bandwidth adjustable over a wide range.

The oscillator for such an analyzer is subject to very stringent frequency stability requirements; in this case a short term (one hour) stability of 1 part in 30,000 is desirable. Except for some loop stability problems, a tunable Meacham oscillator has been found to approach this ideal. A combination of a straight-line capacity condenser and a butterfly condenser gives a nearly linear relation between dial reading and frequency, while a high-Q toroid serves as the inductor.

The filters in the IF amplifier covered two bandwidth ranges, a tuning fork being used for the range of  $\frac{1}{2}$  cps to 8 cps, and a toroid in a Q-multiplying circuit for the range of 10 to 50 cps. Feedback is used to vary the bandwidth of the tuning fork and an additional parallel path is necessary to cancel the direct coupling between input and output coils.

The output of the IF amplifier can be used on a Ballantine voltmeter, or recorded on a 10-inch strip chart recorder. In the latter case, the analyzer oscillator is motor driven and the chart recorder paper is driven by a selsyn motor powered by a generator in the oscillator. Automatic speed changes are used so that the frequency scale on the recorded chart is roughly logarithmic. The recorder pen drive also has a logarithmic response.



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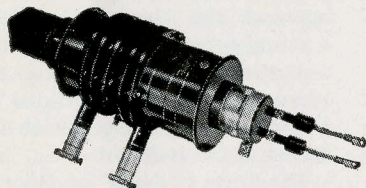
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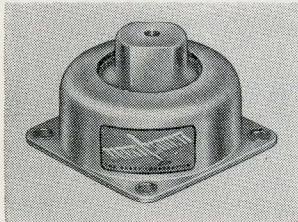
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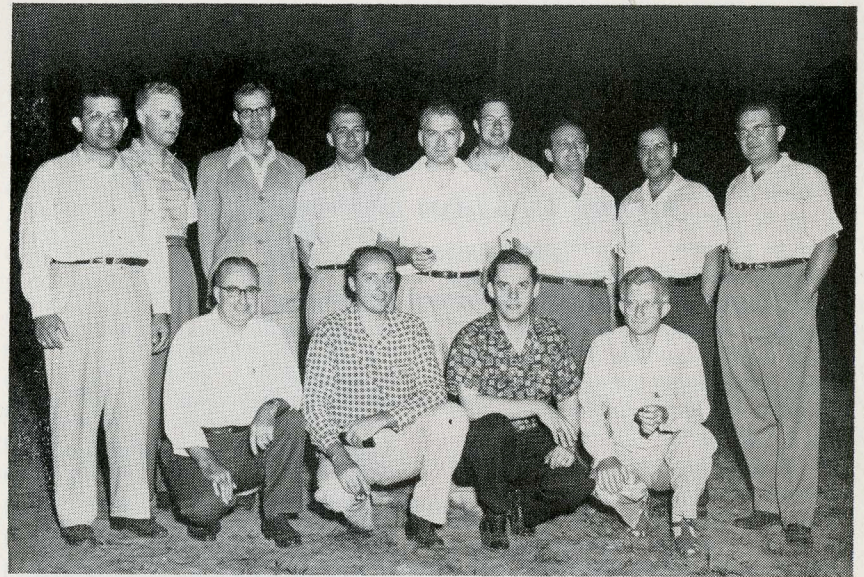
### *Microwave Components*

Flexaguide\* (Flexible guide)  
Bands—Flexaguide & Rigid  
Twists—Flexaguide & Rigid  
Crystal Mixers—Duplexers  
Coax to Waveguide Adapter  
Directional Couplers  
Tapers—Flexaguide &  
Rigid Flanges

\*Reg. U. S. Pat. Off.

### *Aircraft Accessories*

Ignition Manifolds  
Conduit—Fittings  
Spark Plug Elbows  
Connectors  
Power Cable Disconnects  
Junction Boxes  
Thermocouple Connectors  
Wired Assemblies



The Dayton Section, IRE, Executive Committee picnic was almost 100 percent in attendance. Reading left to right: First row—Amos Petit, Jim Dennis, A. B. Henderson, Miles McLennan; second row—James DeLuna, Ernie Adams, Al Parker, Lloyd Perper, Neil Nelson, Stuart Schram, George Rappaport, Maurice Jacobs, and Ben Goldfarb.



Wave Guide Staff in session: Reading left to right: Bob Cooper, Frank Aoyama, Walter Fried, Jim Combs, Jim DeLuna, Dave Clute, Ben Goldfarb, Mary Pat Gauvey and Dan Groszewski.

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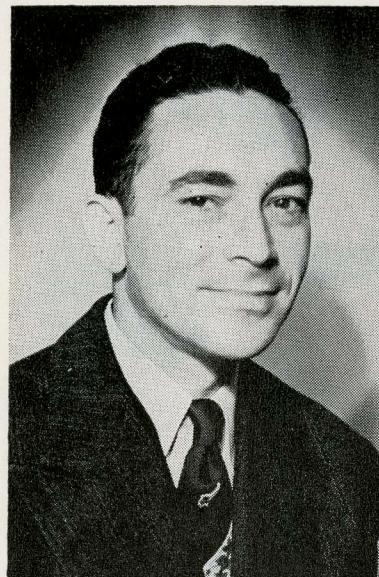
**Electronic equipment of all kinds; control and telemetering instrumentation; sonar and ultrasonic equipment; hydraulic equipment for aircraft; agricultural equipment and other industrial uses.**

**Engineering departments in hydraulics, electronics, ultrasonics, electricity and mechanics; supplemented by a research department with specialists in other fields.**

Local Representative: Mr. William D. Hazlett

1444 Cory Drive, Dayton, Ohio, Tel. No. RA 1029

## Tintypes



Gilbert Arenstein was born in Cincinnati on April 17, 1913, and received his education at the University of Cincinnati, where he received a Certificate in Radio Engineering in 1936 and a B.S. in electrical engineering in 1938.

Gil's interest in radio stemmed from a crystal set given him by his Dad in 1924. A cast-off Crosley 50 (one tube) later served to get him interested in DXing in high school. As a co-op student at the University of Cincinnati, he began working in 1933 at Radio Station WLW. At that time WLW was just installing its 500,000-watt transmitter and Gil spent many an hour on the test schedule which used to run into the wee hours of the morning.

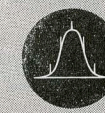
After the outbreak of World War II, with more importance placed on the development of new radio aids, Gil left WLW after nine years to accept a position as a radio engineer with the Communications and Navigation Laboratory at Wright Field. As project engineer and later as assistant branch chief of the Navigation Branch, he contributed

actively to the development of the Air Force radio navigation aids program. During 1944 alone, he actively participated in over 700 hours of flight testing localizers, glide path, marker beacon transmitters and receivers as well as radio compasses and automatic flight coupling units. In 1950 Gil left the C & N Lab to join the Plans Office of the Engineering Division. Currently he is engaged as general engineer under the Deputy for Operations, Wright Air Development Center. Gil is responsible for operational problems which involve the three electronic laboratories and the photographic laboratory.

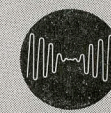
Gil has actively served the Dayton Section since joining in 1948. He was chairman of the Arrangements Committee for the 1949 Conference; Secretary-Treasurer of the Dayton Section and 1950 Conference; Vice-Chairman of the Dayton Section and Chairman for Budget of the 1951 Conference and was President of the 1952 Conference.

Gil, his wife and three boys are regular Daytonians now and reside at 1224 Windsor Drive.

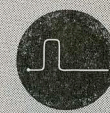
### NEED INSTRUMENTS TO SOLVE ELECTRONIC PROBLEMS?...



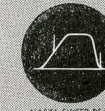
RADA-SWEEP  
Radar R Amplifier  
Alignment



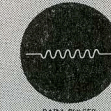
MEGA-MATCH  
Measurement of  
Reflector Coefficient



MEGA-PULSER  
Transient Testing  
Video Amplifiers



MARKA-SWEEP RF-P  
TV Line Alignment



RADA-PULSER  
Radar R Transient  
Testing



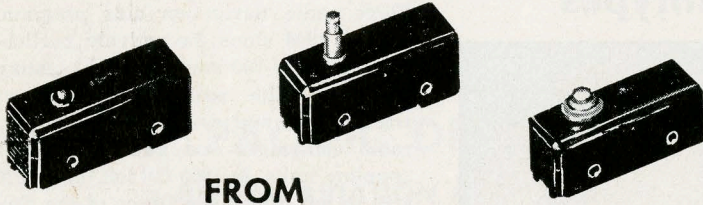
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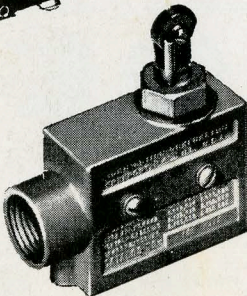
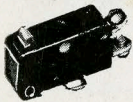
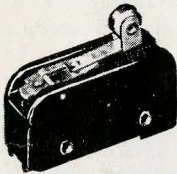
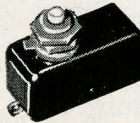
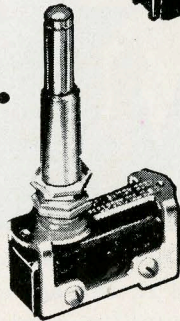
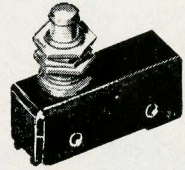
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