tek talk

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tek talk

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TEK NEWSREEL

(A summary of some of the major recent happenings on the Tek scene)

In a lopsided vote, TEKEM shareholders July 24 approved the merger of that corporation into Tektronix, to be followed by a public offering of Tektronix shares, probably in early September.

The vote—1,882,392 to 14,136—was the final endorsement necessary for the company to file registration papers with the Securities & Exchange commission. The proposal already had the unanimous approval of TEKEM and Tektronix directors and Tektronix shareholders.

It was TEKEM's largest shareholder meeting; over 1300 attended.

Next steps include:

To register with the SEC, and to issue a preliminary prospectus—describing the company and its financial condition—to employees, brokers and prospective stock purchasers;

To close the books on TEKEM share transactions, two or three weeks ahead of the public offering, allowing time for conversion of shares;

To offer from 6 to 8 per cent of outstanding Tektronix shares for public sale;

To apply promptly after the offering for listing on the New York Stock Exchange.

President Howard Vollum, main speaker at the two-hour session, recounted the origin of TEKEM and summarized the reasons for the move from indirect to direct ownership at this time.

He recalled his (and Jack Murdock's) comment at the first TEKEM meeting in September 1958, that mergers and stock sales would occur only "if it will be of benefit to the large majority of Tektronix employees." The proposed merger meets this requirement, he said, as he recommended its adoption.

When TEKEM was devised to provide indirect ownership, it was chosen over direct ownership for several reasons. One, most employees were not well informed on the intricacies of stock ownership; another, Tektronix was not competitively established to the point that it wished to divulge financial information to other firms.

Now, TEKEM has given employees experience and education in owning stock. And more of our company financial information has become available. This seems the opportune time for converting to direct ownership—long a Tektronix goal, Howard pointed out.

As part of the public offering, Tek will offer a block of shares to employees at the market value less selling commission. Howard asked that employees interested in buying shares notify Treasurer Don Ellis how many dollars they wish to invest. (Because only a limited block can be made available, it's possible that not everyone will be able to buy as many as he wishes, however.)

Also, if employee interest is high, a plan can be worked out allowing Teks to invest a regular part of their earnings in shares—continuing the spirit of the present TEKEM profit share.

For employees in key positions to influence the company's future, a stock option plan—heretofore impossible—will be provided, effective after the public offering. Participants will be selected by a three-man committee, appointed by and including members of the Tektronix board.

How will public ownership affect Tektronix operations?

The experience of other firms who have taken this step before us indicated that owners' and employees' fears—of outside interference and so on—were largely unfounded, Howard reported.

One effect of the merger will be increased financial activity, to provide quarterly reports required by the New York Stock Exchange, and closer working with and scrutiny by financial analysts.

Another will be extra freedom for shareholders in their financial affairs, he said; still another, an even closer relationship of employees and company.

(The mechanics of converting TEKEM and existing Tektronix shares to the new no-par Tektronix common shares will be explained in forthcoming publications.)

●

Bob Fitzgerald, vice-president, Operations was appointed to the Board of Directors at the Tektronix shareholders' meeting May 8. The appointment was made to fill the vacancy created by Bob Davis leaving Tek. Other members of the board are: President Howard Vollum; Chairman of the Board Jack Murdock; and Secretary and General Counsel Jim Castles.

●

Keith Williams (US Marketing Manager) announced in May that the United States Marketing territory had been realigned into three districts: Eastern Region (Dale Brous, manager); Central Region, (Bill Ewin, manager) and Western Region (Ed Bauder, manager). As a result of the realignment, Bill Ewin will move from the Washington, D.C. field office to Chicago in August.

●

Tektronix construction projects continued to make news:

The new sewage treatment plant began operating in June, processing sewage from Tektronix industrial park, several small business establishments near Tek and a trailer court. The Pasveer aeration system, patterned after those used in Holland, enabled the company to disconnect from the Beaverton sewage system at a considerable savings annually.

The concrete block Chemical Storage building is nearing its August 15 completion date. When finished, the 50 x 100-foot building will be used to store all chemicals at Tektronix. The project also includes a process waste control plant and a lagoon where chemically treated effluent will be neutralized before drainage into Beaver creek.

The 32,000-square-foot Electrochemical building, which will house all Tek's engineering, development and production needs in electrochemistry, is rising along Karl Braun drive. Completion date is September 1.

●

Al Hannmann, former Guernsey staff, was appointed manager of Tektronix Australia Pty. Ltd. and traveled to Sydney to establish Tek's newest marketing headquarters. Scotty Pyle accompanied Al on the initial trip in June and remained for two weeks to help with the many details of getting started.

Besides Al, the newly appointed staff at Tek Australia includes Allan Smyth, accountant, Paul Williams, field maintenance engineer and Jennette O'Shea, secretary. Lew Kasch, field engineer, will transfer from Long Island to Tek Australia in August.

In late June the first shipment of Beaverton-made instruments cleared customs. Personnel are situated in a third-floor office area of a modern building in Sydney.

●

Instrument Engineering announced several changes in reporting responsibilities in May. Bill Polits, IM manager, said in a Newsletter "the most significant are the grouping of technical people by general classification of projects under a project manager system; establishment of a Circuit Investigation and Development group, and the forming of an Engineering Services group (which brings together Militarized Products Engineering, Mechanical Engineering and Component Evaluation services.)"

Project managers are Jack Rogers, Oz Svehaug and Norm Winningstad; John Kobbe (Circuit Investigation and Development Group) and Lang Hedrick (Engineering Services), and all report to Bill.

Also announced were plans to form a Product Planning group within Instrument Engineering which will supplement the corporate Product Planning Strategy group.

●

Bob Fitzgerald and Howard Vollum signed into effect the Payroll Savings Plan for employees in May. In a letter to all employees Howard stated: "Buying bonds helps to strengthen our country's security and improve management of its financial affairs, besides safeguarding ourselves and our families in times of unusual expense."

As a result of the three-week enrollment drive, 576 employees signed up for a payroll deduction, for a total of $3,740.75 per pay period.

●

A special accident insurance program was offered Tektronix employees by Bankers Life & Casualty Co. at a cost of 30 cents per pay period for each $10,000 coverage. During the May 5-25 signup period, no statement of health was required. Since May 25, employees must have their application approved by the insurance company and furnish a statement of health.

No. 6

BYRON BROMS

(Believing that Tektronix owes its stature not only to its research, productive and engineering skills but also to the unique and vigorous personalities of its leaders, Tek Talk has undertaken a search to learn just what some of these people believe.

This is the sixth in a series of interviews. Byron Broms was appointed last winter as Tektronix Marketing manager.)

I'd start by disagreeing with the title of your article: Ideas That Have Built Tektronix.

It's **people** that have built Tektronix; most of the ideas that have contributed to our success aren't unique. Instead we were—and still are—fortunate enough to have many unique people with the doggedness to implement the right ideas at the right time. And, the right idea for some **other** company isn't always the right idea for us.

What are some of the "right" Tektronix ideas?

One of the key ideas, in the beginning and now, has been our respect for the dignity of the individual.

We have no patent on this philosophy. Why don't all companies practice it?

It's hard to say. I'm sure a lot of them **do** live this kind of philosophy.

We've adopted it because of people, I'd say. Jack and Howard were the implementers of this particular idea. Right into the guts of our operation, into the methods of building a scope, you'll find it.

The idea of job enlargement, for example; you **could** break the assembly process into a strict production-line operation, one task for each worker. But instead we've felt it's better to enlarge the chore. to give each person as large a job as possible. This results in job satisfaction.

Respect for the individual is more an attitude, or a state of mind: Constantly searching for ways to provide the best atmosphere for individual growth . . .

Is job satisfaction, then, one key to our success?

It must be a key thing. People don't

work for money; it ranks about fifth in most surveys . . .

What attitudes which fit other companies aren't "right" for Tektronix?

I'd say restricting (as opposed to enlarging) individual jobs, to gain efficiencies. This might be true from a work standpoint alone, but not from a people standpoint.

Another "right" Tektronix idea—and this is merely my interpretation—is our consideration of profit as a result, not an objective. Many companies have profit as their objective—say to make 10 per cent net profit.

Our philosophy is to do the best job we know how—with the expectation that profits **will** result.

This is a very subtle distinction, but it makes all the difference in the world. If profit is your prime business objective, you often tend to latch onto it to the extent that some things you'd otherwise do for your customers, you don't do. You tend to maximize **short-term** benefits . . .

Wasn't the field engineer system of marketing a new idea?

The field engineer approach was not basically a new idea when we decided to start our field organization. However, if my memory serves me, we **were** about the first electronic instrument manufacturer to use this marketing technique.

I'm not sure how this did come about. I tend to attribute the idea—and its implementation, which is most important—to Dal Dallas. Although Howard and Jack had a lot to do with it, it was mostly Dal's determination, and his vision as to what this would mean to Tektronix.

When did your career with Tektronix begin?

I came here in February 1951, when we were at Seventh and Hawthorne. In August of that year we moved into the Sunset plant. I started out in the Test department and was there for probably 9-10 months. There were George Edens, Will Marsh and Jack Henderson. Bob Herren supervised us. As near as I can recall, there were 75 to 90 people in Tektronix at that time.

I went from Test to the marketing end of the business, working for Dal, doing what our Field Information staff engineers are now doing: Providing technical assistance to our one or two field engineers, and to our representatives (about eight at that time). We'd just started our Bronxville office; Jack Cassidy and Ed Bauder were there. Francis Frost and Jack Day followed . . .

When I opened the Syracuse field office in July 1952, Tektronix had carved out its own field engineer areas, covering Washington, D.C.; Boston; all of New York state, and the industrial belt of Canada.

Syracuse was our third office, preceded by New York and Baltimore. I covered all upper New York state, Ontario and Quebec.

Were there FMEs then?

Yes. The field engineer was his **own** FME. He still is, to a certain extent; he does provide technical services to customers, and repairs (although not a complete factory recalibration) when circumstances permit.

The field office now is basically the same as it was. The nature and amount of work in an area brought about the need for the FME, who is a specialist in recalibration and repair. Backing up the FE's whole effort is the repair center, equipped to do a complete job.

The field maintenance engineer idea started about 1953 in Bronxville. Paul Hansen went from here to New York, and was our first FME.

The need we saw then was for a factory-grade repair service to meet customer demands. This wasn't new to the industry but was, rather, a natural consequence of selling our first instrument—and of opening our first field office.

Do our competitors have field-type organizations?

Dumont, Hickok and others continue to use manufacturers' representatives. Hewlett-Packard until a year ago worked entirely through representatives. Now they have changed to their own field organization.

Were there any major problems in setting up our field organization?

The number one problem was people.

I don't mean people are a problem. I mean there was difficulty in obtaining well-qualified people. The field engineer still **is** a relatively difficult position to fill (although we have been able to find enough good people). The reason is, we require not only technical competence—which spells an engineer—but also an outgoing personality, and so on . . .

Our move to a field organnization **did** produce some feelings, certainly, on the part of those we disassociated from. There were also some (temporary) misgivings by customers in areas which had been well served by representatives.

These representatives had developed customer loyalty; some customers viewed our act as brutal—and some honestly felt we couldn't do as well as the representative had.

But—in my own experience in upper New York, and in all areas—we were able through technical competence, knowledge of instruments and direct ties with the factory, to demonstrate rather quickly that we had much more to offer than the representative.

Thus we could talk with the user in terms **of** the product and how it could best solve his problems. Our means of selling is skillfully pointing out this need. The customer must be convinced our instrument will allow him to do his job better, more efficiently or more economically.

Did we gain the benefits we expected from converting to a field organization?

We got **all** the benefits we'd looked for. We'd agreed that the principal one would be establishment of as close a relationship as possible between Tektronix and its customer group.

Backing up a minute, as to **how** we got there:

We had a complex product. We felt if we could obtain the **most** desirable customer relationship, we would want to have a design engineer in contact with the customer, because he understands all the compromises involved in the instrument, and exactly how it works. He would be in the best position to describe to the customer how that instrument would solve his problem.

Of course, this wouldn't be practical.

The next best thing, we felt, was to place a **field** engineer—a technically competent person, thoroughly conversant with our product and in close communication with the design engineer—in contact with the customer.

On what basis did we select our first field engineers?

Primarily they had to be electronics-oriented. We were also after people who appeared to be outgoing, capable of meeting and talking with our customers and of conveying to them a feeling that "Here stands a person who measures up to the quality of the instrument I'm buying."

The field engineer (and it's just as true today as it was 10 years ago) is about the only personal contact most customers have with Tektronix. We feel strongly that the guy has to be a real sharp individual—in **many** ways.

We hired Jack (Cassidy) and Ed (Bauder) with the idea that they'd go to New York City. But, following that, the bulk of the field people for several years were out of our own Test department.

How good is our field organization? In what ways is it different from, or better than, what competitors offer?

I would get back to some of the things I said at a recent group representative meeting, about our objective: **Being responsive to customer needs.** That emphasis is at least one of the things that have made us the best.

Another is the emphasis we place on technical competence. Selling—then and today, too— is on a basis of demonstrating to the customer that we have an instrument that **can** solve his problem—a technical kind of selling.

The emphasis we began with in those early days—on technical competence—was good; it gave us the right kind of start, and still remains one of the biggest door-openers we've got.

How do you look at the rest—the non-field part—of the Marketing organization?

I consider them a support to the primary activity (in the field), and a vital part of the overall marketing effort. Rapidly filling customers' requests for replacement parts is a good example. If someone has a kaput scope and a replace-

things that place a company ahead...

ment part is needed, we can supply it quickly. If there are technical problems that the field engineer can't immediately answer, the Field Information group can backstop him . . .

They are the means whereby the field engineer **can** be responsive to customer needs. He is the contact, but if he's not well supported from here, he can't be the **kind** of contact he'd like to be—and the kind we need to have.

Could you elaborate on Dal's contributions to our Marketing effort?

I don't know whether to ascribe **all** the field engineer direction to him, but the establishment of the Tektronix field organization was largely a result of his determination—and I'd say his vision, too.

Dal started—and fostered—the Tek field engineering organization, an organization that today still is the envy of the industry. He insisted on technical capability, ability to truly represent the company, adherence to principles and being responsive to customers. He hired the field engineers, or was personally very instrumental in hiring them, up to 1955 or 1956.

How about another large area of Marketing—the export activity. How did this develop?

Again it was Dal—through his ability to visualize the market potential, of the way things **might** be two or three or four years ahead. He was almost solely instrumental in getting us into the export market.

Our first association overseas was in 1948, with Erik Ferner, a manufacturers' representative in Sweden. This arose more from the need there than from being initiated here. The word had begun to spread in Europe that 511s and 512s were the best instruments to be had.

Export activity went fairly slowly from 1948 to 1951, then during the Korean war we were unable to fill the orders. After Korea, things moved fast. Dal went to Europe in '52 or so and got a few more representatives lined up.

Dal perceived there would be a good-sized market there. Again, through his doggedness and determination, he saw that we got an export organization. At this stage, he was pretty much a lone wolf.

I'd say, by the way, that this was another good example of "the right idea at the right time."

On what basis did we select our distributors?

In general, our criteria were technical competence and ability to provide service. We insisted on emphasizing the application of our instruments to customer problems—and we looked for organizations of high integrity and financial soundness.

Is our export sales percentage larger than that of other electronic instrument manufacturers?

There's no real way to assess, but overseas sales, percentagewise, may be significantly larger than many other companies'.

What do you consider Tektronix' greatest strengths?

Without qualification, our greatest strength lies in people—everyone in the organization. Not in terms of sheer manpower, but in this respect: We have a large group of people who exhibit the ability to grow and to contribute. It's our greatest single resource—as in any company, of course.

One **great** strength is adherence to principles; for example, integrity in pricing—offering the same price to all customers, rather than negotiating prices to gain short-term advantages . . .

I know some employees have said Tek is a really fouled-up organization; yet the same people not only are willing but—I deduce—**want** to continue working here. I wonder, what **is** it we've got? A combination of many things, probably.

On the plane the other day, Keith Williams (U.S. Marketing manager) commented to me that this is the only industrial situation he's ever seen where you don't see any of that crazy writing on the men's room walls . . . . It's a small thing, but it's part of an attitude which says "This is **my** place—I'm going to do my part to make it reasonable to work in."

Are there any Tek weaknesses that concern you?

The greatest potential weakness is fear of ourselves, and of our ability to continue to do the kind of job we've done in the past. Too often, because we feel our problems are unique to us, they seem bigger than they really are; often the fact of the matter is, we're just one of many firms concerned with the same (or at least a similar) problem.

What's more, in many instances our directions toward solutions are better than, or ahead of, other companies'.

As to these "other companies": Probably we're more like them now than we were when we were smaller. The differences are not as great; they're real subtle—but they're extremely important.

In industry today the competitive edge is honed razor sharp. So it's the **subtle** things that make a company different, or place it ahead.

We should attempt to establish clearly in the minds of our people what those subtle differences **are**—dignity of people; profit as a result and not an objective; and, at the top, the ability to recognize customer **needs** and respond to them.

Are you speaking from the standpoint of people in Marketing?

No, from the standpoint of Tektronix. For example, Manufacturing also has to be responsive to the customer's need, or we can't supply it. It's just as true of engineers; they must be responsive in a way that **anticipates** that need.

My belief is, **everyone** in the company is "in marketing."

the OSCILLOSCOPE draws a

(The following article originated as a script for the film, "The Oscilloscope Draws a Graph," produced by the Communications department Films group. It has been modified and reprinted here because of its non-technical approach to a subject of general interest to many employees and their families.)

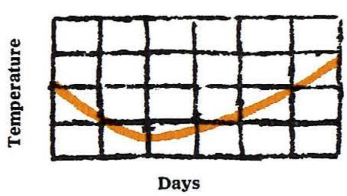
By ARLAN EVENSEN

An oscilloscope is an extremely complicated piece of equipment. But this doesn't mean you must be an electronic engineer to understand basically how it works and what it's used for. Its principles are quite simple and can be understood by most anyone.

The oscilloscope, an electronic measuring instrument, is usually used to **draw a graph.** Before going further, let's quickly review how simple graphs are made.

A graph normally has two components, or directions: A horizontal axis and a vertical axis. Often a graph records the changes in some event with relation to time. Then the horizontal axis represents **time** and the vertical axis the **amount** of the event.

The event we're talking about could be temperature, in which case the vertical axis would be marked off in **degrees** of temperature. Each division on the base line, or horizontal axis, would represent a unit of time; for example, one day per division. Now if we take a reading of each day's temperature, plot it on the graph and then draw a line connecting all the points, we have a graph showing how temperature varies from day to day.



Suppose we were to list the highest and the lowest temperature recorded each year for the past 100 years in a particular area. This list alone would contain very interesting historical information. However, if we took this information and plotted a graph with each division on the base line equal to a year, this same information would suddenly have much **more** meaning to us than as a list. In a graph, we could see at a glance the relative changes from one year to the next.

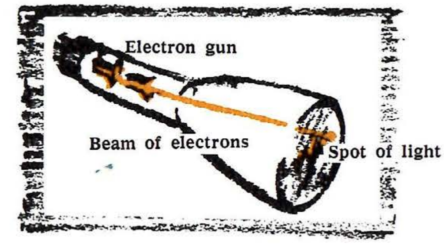
We might find that the changing temperature followed a cycle that repeated itself every 10 or 12 years. We might find that the colder times of the years are getting colder, or that the warmer periods are getting warmer. We could probably even make a good guess as to what the future chain of events would bring. Many things would become immediately apparent from the graph that would not be easily noticeable on the list.

Graphs can be made mechanically, by machines. A roll chart of graph paper can be driven by a motor at a constant speed while a mechanical pen traces a line on the chart. The pen's position can be controlled by a temperature-measuring device, a barometric-measuring device, a voltage-operated device, or whatever type of device is necessary to measure the phenomenon we want to record.

How fast can you draw a graph? How fast can a mechanical device draw a graph? What if you wanted to record, as it occurs, something that happens in only a tenth of a second? How about a **billionth** of a second? It's obvious that this graph could **not** be done with paper and pencil. Here you would use an oscilloscope to draw your graph.

How does an oscilloscope produce a graph? Without getting technical, let's discuss the oscilloscope's operation a bit.

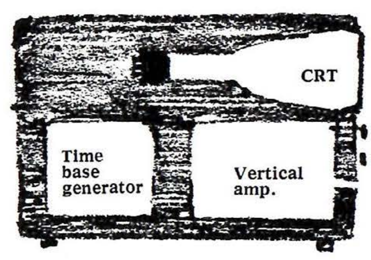
Perhaps the most important single item in an oscilloscope is the cathode-ray tube —the window through which the scope displays its information. The cathode-ray tube has a screen. The neck of the tube contains an electron gun, which produces a beam of electrons that is focused onto the screen. When the electrons strike the screen it glows, a spot of light. By applying proper voltages to the CRT this spot of light can be moved across the screen, either from side to side or up and down.



This is the important thing to remember about the cathode-ray tube. A spot of light is produced on its screen and can be moved in any direction by applying proper voltages. The moving spot is the means for drawing a graph. The screen takes the place of a piece of paper and the electron beam takes the place of a pencil or pen.

To draw a graph, though, the whole oscilloscope is necessary. In addition to the cathode-ray tube there are two main sections in the scope: The vertical amplifier section and the time-base generator. (Of course, the oscilloscope is **much** more complex than this; we're making only a simple analysis.)

The **time-base generator** produces an electrical signal which, when applied to the CRT, causes the spot of light to move across the screen from left to right at a very uniform speed. When the spot reaches the right side of the screen it is extinguished and returned immediately to the left side, ready to sweep from left to right again.

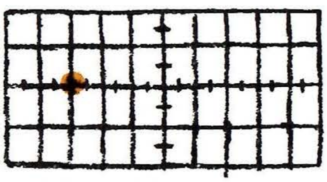


In front of the screen is a plastic **graticule,** ruled off into divisions, much like a sheet of graph paper. By adjusting the proper front-panel control, the scope operator can make the spot take almost any amount of time to cross the screen.

For example, the spot can be made to travel at one second per division. Since there are 10 divisions, it will take 10 seconds to cross. Or the control can be adjusted so the spot will take **one** second to travel across the screen; then each division represents 1/10 of a second. The scope can be adjusted so each division represents 1/100 of a second; a millionth of a second; or one of many steps between. At the slower speeds we actually

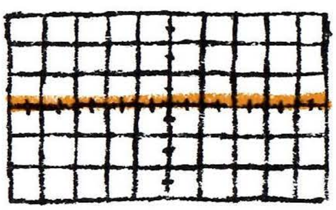
GRAPH

see the spot moving; at faster speeds we perceive it as a solid line across the screen—even though it is still a single spot.



1/10 sec/Division

Total sweep time— 1 sec.



1/1000 sec/division

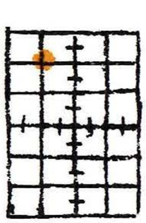
Total sweep time 10/1000 sec.

So far, we have produced the **time-base** of a graph. It is the same thing as the horizontal base line of **any** graph, with each division representing a certain interval of time. In an ordinary graph, each division might represent a minute, an hour or a day, whereas on the oscilloscope each division often represents a thousandth or millionth of a second.

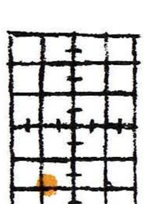
To plot a graph of some event against this time base, we must use the other section of the scope known as the **vertical amplifier.** All we have to do is connect a small electrical signal to this amplifier and the spot will move up and down on the screen.

We could use a battery. If we connect the positive terminal, the spot will move up. If we connect the negative terminal, the spot will move down.

We can adjust the controls to make each vertical division represent many volts, or a small fraction of one volt. By noticing how many divisions the spot moves, we can tell exactly the voltage of the signal.



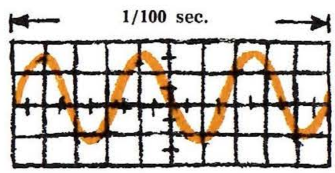
Each vertical div. represents one volt.



2 volts positive **2 volts negative**

It is possible, then, for the oscilloscope to plot a graph of any event or phenomenon that can be converted into an electrical signal.

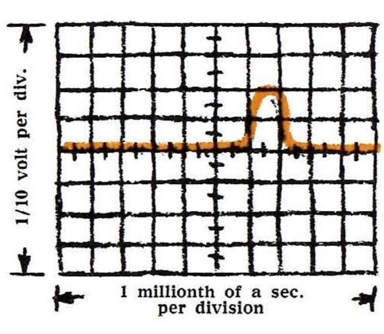
If we connect a microphone to the vertical amplifier, we can plot a graph of what sound looks like. A note played on an organ might look something like this:



As the trace (curved "line" formed by the moving spot) goes above and then below the center line, it represents one vibration, or cycle, of sound. If the scope is adjusted so it takes 1/100 second for the spot to cross the screen, and if we see in the diagram that there are three complete cycles in that 1/100 of a second . . . . . that means there are 300 cycles of sound each second. So, by means of the scope, we have determined the **frequency** of that sound.

Of course, there are much more useful purposes for the oscilloscope:

Let's assume a radar set is giving us trouble, and that we're the technician who has to repair it. Technical information tells us a particular circuit in this set is supposed to produce an electrical signal that is .3 of a volt and last only a millionth of a second. We have reason to suspect (being the good technician that we are) that this circuit is malfunctioning—not producing the signal correctly. How do we find out? Only an oscilloscope can measure something that happens in a millionth of a second. So we set up the scope and connect it to the proper circuit.



The picture we see is shown here: We've adjusted the scope so each horizontal division of the base line represents a millionth of a second and each vertical division a tenth of a volt.

We can see that our signal or electrical pulse is exactly one horizontal division wide, which means the duration of that pulse **is** one millionth of a second. However, we notice that it is only **two** vertical divisions high, which means it's two tenths of a volt, not three tenths. Maybe that's what's wrong with our radar set.

The oscilloscope has told us several things about this electrical pulse: Its time duration (one millionth of a second), its amplitude (.2 volt), whether it is positive or negative, and its actual shape. Without the oscilloscope we would never have found out these things.

Many types of phenomena, or events, are **recurrent.** That is, they happen over and over in a repetitive cycle. When the oscilloscope is used to view an event that occurs in this manner we will see a continuous steady image on the screen. The examples talked about previously have been of this nature.

However, the oscilloscope also can be used to graph events that happen at a random rate—or maybe only **once.** An atomic explosion, the thrust of a rocket engine hurling a man into space, the radiation of particles as an atom is split. These can be displayed as a graph on the oscilloscope, and permanent records can be made.

Special cameras can permanently record an event on film as the graph is traced across the oscilloscope screen, even though the event may have occurred in a millionth of a second, and occurred only once.

On certain new scope types it is possible to trace a graph once, then **store** the image right on the CRT screen. When it's no longer needed, the image can be erased and the scope is ready to trace another graph.

Special devices allow us to convert almost any phenomenon into an electrical signal. And anything that can be converted into an electrical signal can be measured on the oscilloscope: Heat. Light. Sound. Gravity. Pressure. Acceleration. Chemical reactions. . . .

In this age of atomic energy, missiles, space travel, medical breakthroughs, communications improvements, scientific research, industrial growth, educational advances, the use of the oscilloscope seems almost unlimited. Electronic science demands that we know "how much" and "how long." Even though the "how much" may be in thousandths of a volt and the "how long" may be in billionths of a second, the oscilloscope gives us the answers.

In summary: Although the oscilloscope is a complex electronic instrument, we can simplify its operation by saying that it **draws a graph** of some event with relation to time. Its vertical axis measures **amount;** its horizontal axis measures **time.** The scope is accurately calibrated so we can make each horizontal division represent any amount of time, from several seconds to less than a millionth of a second. Also, we can make each vertical division represent an exact amount of voltage so we can accurately measure the **amount** of whatever it is we are viewing.

The ingredients: A vertical amplifier section, a time-base generator, a cathode-ray tube, hundreds of additional parts and components.

The product: One of the most versatile electronic measuring instruments — the oscilloscope.

MEET MEARS

"The load regulator is meeting with rather phenomenal success in most areas of the country, and in some foreign countries too. Apparently we came out with the regulator at the time it was most needed."

These comments, from the advertising manager of Mears Controls, Inc., reflect the enthusiasm with which the electric industry has greeted the company's newest product line.

Mears Controls has been Tektronix' industrial neighbor in our park since early 1960. Prior to that time, two Mears companies—Mears Electric Controls, Inc. and Mears Electric Circuit Breakers, Inc. —occupied a large war surplus building on Swan Island. The present 20,000-square-foot building, located on Millikan way between the Interim Office building and our warehouse, contains administrative, production and shipping activities for Mears's triple product line.

The company had its start in 1957 when A. M. Mears and J. S. Mears—father and son—bought out Electric Controls, Inc. This company, which manufactured electric heating controls, was later renamed Mears Electric Controls, Inc.

In 1958 Mears chartered another company, Mears Electric Circuit Breakers, Inc. This company manufactured a complete line of low-voltage air and fused circuit breakers of their own design; it also acquired an exclusive license to manufacture specific types of circuit breakers patented by CEMCO Electric Manufacturing Company Ltd. of Vancouver, B.C.

In 1960 the two companies were incorporated into Mears Controls, Inc. About 45 employees are on the payroll.

Since Jack Mears's death in September 1961, his father has been president.

Mears has three main product lines: Low-voltage power circuit breakers, thermostats and load regulators.

Mears circuit breakers are used nationally by most of the leading independent switchboard builders in jobs ranging from the installation at Christmas Island (a Central Pacific atoll where bomb tests are conducted) to department stores, factories and high-rise apartments. Local users include Lloyd Center, Eastport Plaza, Portland State college and the new Main Post Office. Tektronix uses Mears circuit breakers in the CRT building.

Thermostats built by Mears but brand-named for a particular customer account for about half the sales of the wall-mount type. They also produce a line of inbuilt thermostats, for installation in heaters made by other manufacturers.

The newest product line—load regulators—offers safe and economical circuit protection through the priority system of control. Since many dwellings were built and wired before the introduction of new electrical devices, available lines into the home cannot handle the increased power load caused by dishwashers, clothes dryers and even electric ranges. With the Mears load regulator, loads are divided into first priority, or preferred loads such as lighting or ranges, and second priority, or loads which may be temporarily deferred, such as water heaters or dryers. When current usage exceeds a previously assigned level, the load regulator automatically shuts off power to second priority equipment. When a safe usage level is reached, it restores the second priority circuit to operation.

Among the new housing projects using the load regulator is Riley Center in Indianapolis. The center will include a complex of 2000 apartments. In the first phase of construction, 500 load regulators have been installed.

Don Lien, Mears's advertising manager, commented, "We are still lining up representatives for this product, but we have several thousand salesmen working for us through the courtesy of many utility companies. They have seen the need for this item and are so anxious to see it used that they organize their own classes to instruct their salesmen in how to use and apply the Mears Load Regulator."

Since a large proportion of Mears's business is conducted with original equipment manufacturers, most of their advertising is by direct mail and personal contact. They run ads in trade journals, but most contacts are made through a news release program, which has resulted in some of their biggest sales. News releases, announcing new products, appear in trade publications such as Electric Heating & Air Conditioning, Electrical South, Electrical West and Electrical Heating Journal.

"Men From Mears"—factory representatives located throughout the US— handle customer contacts and carry on an aggressive sales program. Charles Schmidt, vice-president in charge of sales, operates a sales office in Westfield, N.J., which serves states east of the Mississippi.

Executive vice-president B. C. "Red" West also serves as general manager and sales manager at the Beaverton office. The genial executive contrasted Mears's operation to Tek's. "We're a small but growing company. And most of us wear several hats. I'm general manager and sales manager. Don (Lien) is advertising manager, but he's also my administrative assistant, a divisional sales manager and personnel manager."

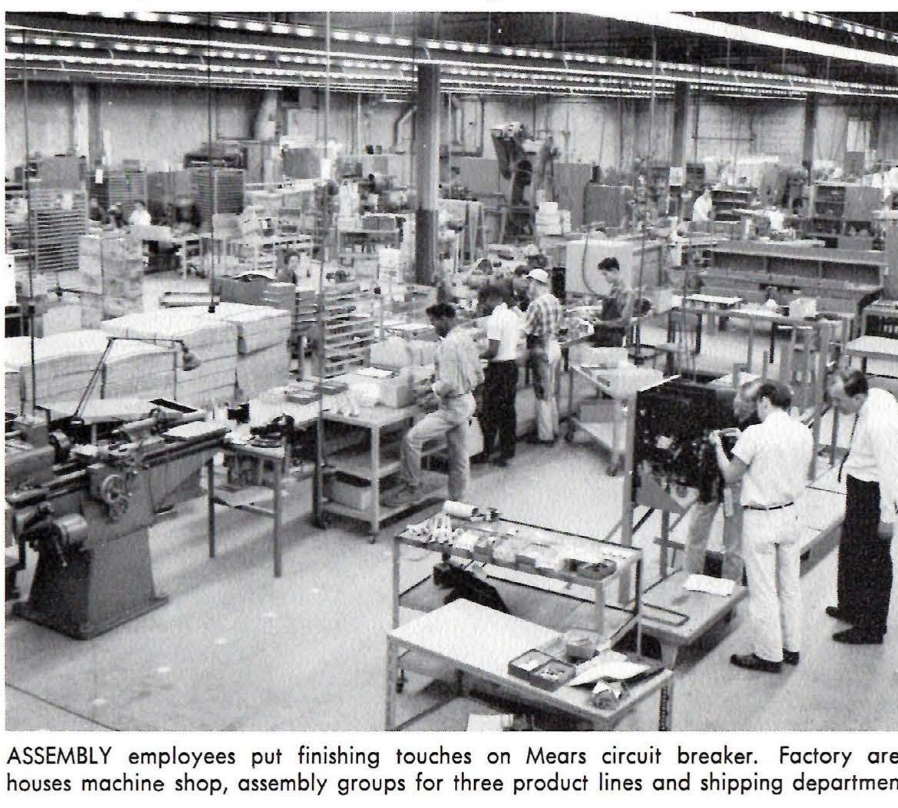
Mears's engineering staff is headed by Herbert Taylor, a specialist in measurements, control design and product design who holds American, Canadian, European and Australian patents in transformer protection and circuit breakers. Six technical papers, prepared by Mears engineers, were read at the Institute of Electrical and Electronic Engineers this year.

Roger Sjordal, formerly of Havre, Montana, is secretary-treasurer of Mears and heads the accounting department. Roger was with the Stramit Corporation before joining Mears.

Like Tektronix, Mears encourages employee recreational activities. Although they don't have enough employees to have a softball team, several employees join other teams in the area. During fall and winter months the bowling league bowls at Valley Lanes. A model airplane club recently started, and several employees are radio "hams".

The company has a picnic each summer and a Christmas dinner and dance. Last year's picnic was at Eagle Fern park; the dinner-dance was held in the Memorial Coliseum Memorial Room.

Of the more than 40 industries manufacturing electrical heating control equipment, six are recognized leaders. In addition to Mears, Honeywell, White Rogers, Wilcolator, Penn Controls and Robertshaw-Fulton are at the top. Mears ranks among the top three, although its physical facilities are smaller than the others. Financial figures are not available from this privately-owned company, but it is apparent to the observer that business is good and morale among employees high.



ASSEMBLY employees put finishing touches on Mears circuit breaker. Factory area houses machine shop, assembly groups for three product lines and shipping department.

Karl Braun


Art: Paula Sweynor

(Roads in Tektronix Industrial Park have been named after three outstanding scientists who have contributed much to physics and electronics: Robert A. Millikan, A. A. Knowlton and Karl Braun. This article will discuss some of Karl Braun's contributions.)

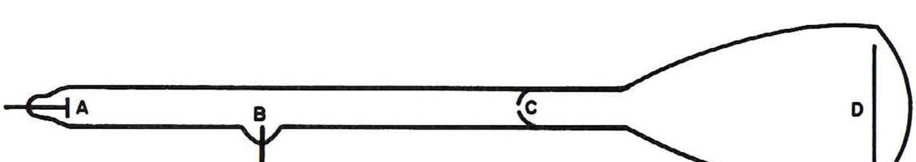
Karl Braun's work on the cathode-ray tube enabled him to further his efforts in wireless telegraphy, for which he was awarded the Nobel prize for physics in 1909, jointly with Guglielmo Marconi.

Braun was born in 1850 in Prussia. He received his doctor's degree from the University of Berlin in 1872. In the following years he taught at several universities in Germany. Later he came to the US. He was detained here for several years due to World War I, and died here in 1918.

In 1897 he published an account of the cathode-ray tube (the Braun tube) that enabled him to make a study of electric oscillations with frequencies of over 100,000 per second. This was the same year J. J. Thomson, of England, made his tube for measurements to determine the identity of the electron (Thomson's tube was used for this experiment only.) Thomson did not think of his tube as a CRT, but merely as something to prove his theory that the electron was influenced by both magnetic and electric fields. Braun's tube was much larger than Thomson's, but much simpler in design. Braun's tube was the first CRT as we know it.

The drawing illustrates the parts of the Braun tube: (A) *the cathode* is a plane disc perpendicular to the axis of the tube. (B) *the anode* is to the side of the tube so it is clear of the path of the rays. (C) the *diaphragm* of metal (aluminum or tinfoil) is uninsulated. The diaphragm has a circular hole about 2mm. in diameter; the important *result* is that the jet of rays issued from the hole and down the tube is cylindrical, thus making one spot on the screen, instead of a flood of rays.

Another important contribution was his introduction of the "fluorescent screen", a *mica plate* (D) coated on the side bombarded by the rays with a fine layer of mineral substance, chosen for its intense fluorescence under cathode-ray bombardment.



The Braun tube worked like this: a narrow beam of cathode rays passed between the plates of the diaphragm. The beam then focused on the fluorescent screen, where the motion of the luminous spot mapped the oscillations of electric or magnetic fields through which the beam had passed. Precise information could be obtained by studying the image of the spot with a rapidly rotating mirror, facing the CRT.

Of course Braun's tube isn't nearly as complicated as a modern day CRT. To compare the Braun tube to modern CRT's would be like comparing the Wright brothers' plane to jet airliners.

There have been many intermediate steps working up to the modern tube, yet the basic principles of todays tube are the same as in Braun's.

Tektronix tubes are made of evacuated glass or ceramic containers. Inside the tube is a device called the gun, which generates the electron beam. The gun consists of three or more elements, then the focusing electrodes, anode or anodes, vertical and horizontal deflection plates, helix and phosphor face plates.

Braun's tube was a great assistance to him in later investigations of wireless telegraphy.

In the course of his electrical studies, he discovered a phenomenon which was to make possible the "crystal set" (radio) so familiar in the 1920's: A large number of substances, mostly crystals of binary compounds, had the property of offering more resistance to a current passing in one direction than to one passing in the other; such a crystal when placed in a circuit through which an alternating current is flowing, partially suppresses the current in one direction but allows it to pass through in the other, thus acting as a rectifier (changing AC to DC without intermediate transformation of energy). As early as 1901, when audible reception first came in, Braun urged that the possible use of these substances be thoroughly examined.

Marconi's original radio system had its weak points. One was the comparative weakness of oscillations emitted from transmitters, due to damping; another, that the waves from different transmitters jammed each other at the receiving station. These were the problems Braun gave his attention to when he started working on wireless telegraphy.

From 1899 to 1905 Braun worked on numerous experiments in wireless telegraphy too detailed to go into. He solved many of the practical problems in Marconi's system and made many other improvements.

Marconi was the brilliant amateur, not indifferent to the commercial value of his spectacular achievement. Braun, who shared the Nobel Prize with him was the trained physicist applying his knowledge both theoretical and practical, to this new branch of electrical science, with little thought beyond the solution of the problem. Marconi protected his inventions by patents; Braun gave his freely to the scientific world.

Marconi's name is a household word, Braun's almost unknown.

TEKROSTIC NO. 2

A 16 63 78 9 52 32 — Potential chips

B 66 42 126 25 76 48 29 — Regular procedure

C 96 90 91 118 87 142 129 103 — Irishmen, Texans, residents of Vernonia and all other people

D 6 2 18 73 — Fired

E 122 14 69 131 109 61 77 111 54 — According to Tektronix' operating manual, legitimate reasons for missing work

F 127 120 68 134 37 137 51 84 — Race ending in a tie (2 words)

G 133 35 121 44 100 — Over

H 95 47 138 23 3 19 — Backward person

I 135 12 82 36 125 59 — Fairly common way to write "Mother"

J 26 67 98 8 56 132 139 21 86 — Signs of sleepiness (2 words), associated with overweight pupils

K 5 123 130 34 57 117 119 — Divan, or sofa; Turk; misspelled car seller

L 30 102 116 40 45 70 — Important people (slang)

M 112 85 1 79 128 94 28 — Creators

N 65 92 38 60 99 74 41 — Genuine screwball (2 words, slang)

O 97 110 17 75 55 62 — Stylish; showy

P V(39) E(15) S(144) T(50) R(43) Y(105) — Room attached to a church

Q 88 101 20 115 — Cantankerous; ornery (slang)

R 143 93 49 71 31 13 106 4 58 — Bottom of the hydrogen-weapon stockpile (3 words)

S 113 11 141 24 — Common job performed at service station

T 107 104 53 81 64 22 10 114 46 136 27 7 33 72 124 — Much warmer than the a-ver-age 24 hours (3 words)

U 140 83 89 108 80 — Pale bluish purple

INSTRUCTIONS

1. Fill in the word blanks A through U. (We've done word P as an example.) Do as many words as you can, then . . .

2. Transfer the letters from the words into the indicated spaces on the acrostic square. (The letters in word P have been transfered, to start you off.)

3. The acrostic square—when completed—will spell out a complete quotation about Tektronix. The message reads left to right **across** the puzzle. It does **not** run up and down like a crossword puzzle.
Words in the quotation are separated by dark square **only**—not by the end of a line.

4. Puzzlers often find it easiest to work not only from the word list to the acrostic square, but also back **from** the square **to** the list. That is, when you can guess a word in the quotation, fill it in and transfer the letters to the proper blanks in the word list.

5. When the puzzle is completed, the first letters of words A through U, read from the top down, will spell out the **source** of the quotation (the person who said it, or the publication it came from, or both.)

ANSWER TO LAST TEKROSTIC:
"If we preserve the abilities and attitudes of the people in the organization, and the atmosphere that will keep the attitudes healthy, no one will outproduce us."

—Robert Fitzgerald

			1 M	2 D	3 H	■	4 R	5 K	6 D	7 T			
		■	8 J	9 A	10 T	11 S	12 I	13 R	14 E	15 P E	■		
16 A	17 O	18 D	19 H	20 Q	21 J	■	22 T	23 H	24 S	■	25 B	26 J	27 T
28 M	29 B	■	30 L	31 R	32 A	■	33 T	34 K	35 G	36 I	■	37 F	38 N
39 P V	40 L	■	41 N	42 B	■	43 P R	44 G	45 L	46 T	■	47 H	48 B	■
49 R	50 P T	51 F	52 A	53 T	54 E	■	55 O	56 J	57 K	58 R	59 I	60 N	61 E
■	62 O	63 A	64 T	65 N	■	66 B	67 J	68 F	69 E	■	70 L	71 R	72 T
73 D	74 N	75 O	■	76 B	77 E	■	78 A	79 M	80 U	■	81 T	82 I	83 U
84 F	85 M	86 J	■	87 C	88 Q	89 U	90 C	91 C	■	92 N	93 R	94 M	95 H
96 C	97 O	■	98 J	99 N	100 G	■	101 Q	102 L	103 C	104 T	■	105 P Y	106 R
107 T	108 U	109 E	■	110 O	111 E	112 M	113 S	114 T	115 Q	■	116 L	117 K	118 C
119 K	120 F	121 G	■	122 E	123 K	■	124 T	125 I	126 B	■	127 F	128 M	129 C
		130 K	■	131 E	132 J	133 G	134 F	■	135 I	136 T	137 F		
			■	138 H	139 J	140 U	141 S	142 C	143 R	144 P S			

Teks

DAVE CHRYSLER (IMSE Specs) can talk about Russia a little more knowledgeably than most people, for two reasons: One, he visited there this year; two, he talked with many Russians—in Russian.

Speaking the language has advantages: Russians are delighted that Americans consider their tongue important enough to learn. It also has disadvantages: They tend to suspect a Russian-speaking American as being up to something sneaky.

Dave, who learned Russian partly so he could translate Soviet technical papers, spent five weeks in European Russia, including five days aboard a Russian ship between Yalta and Greece.

BORDER OFFICIALS paid little attention to what he took **out** of the country, but went thoroughly through what he took **in.** Did they look for anything in particular? "Yes. They asked if I was carrying any phonograph records." (If this was to keep Western jazz out, it was pointless; most Russian night clubs and eating places feature rock-and-roll.)

WHAT WAS HE ASKED most often? "Do Americans want peace or war?" In second place: "Why do you mistreat Negroes?" More personal questions: "Are you related to Chrysler the automobile?", "Are you a capitalist or a worker?"

His answers:

1. We're like you; we have children, too. People are pretty much alike; most of us want peace.
2. There is some race prejudice, but the government is working for justice and equality. (This is a tough topic, he notes, because Russian newspapers play up reports of US racial squabbling).
3. No, no relation.
4. I'm a worker. So, he added, is the founder of the company for which I work, who shares the profits with us. (They liked that pretty well, he says. Small wonder; as we understand it, they're part of a profit-sharing outfit, of sorts, themselves).

A collection of photographs of Tektronix (which somehow were approved at the border inspection) made a big hit with Russians. They were especially impressed with the excellent American working conditions—and with the fact that there's no racial discrimination in hiring.

RUSSIA HAS no outdoor advertising, but slogan-bearing billboards abound:

- Exceed the Quotas of the Seven-Year Plan.
- Peace to All People.
- (With a drawing of a foppishly dressed fellow) We Don't Have THIS Kind Here! (Russians don't go much for fancy dress or ostentatious display.)

ALL IN ALL, things in the Soviet Union seemed better than he'd been led to expect. People appear happy (although they laugh very little) and proud of their government (they never make fun of it). They're proud also of their cosmonauts, but they don't rub it in to the American visitor.

The state emphasizes the dignity of labor—labor of any kind. The family also is emphasized and family ties seem stronger than in America: You seldom see unaccompanied children—and almost never a child who's crying.

Propaganda is continuous and pervasive. A little boy, viewing relics in a museum of Czarist treasures, pointed to a jeweled goblet and sighed to his mother: "Wicked gold."

NEW RESIDENTIAL buildings in the Soviet Union appear shoddily built. They have a saying: "The only new-looking buildings are our old buildings."

Is Russia drab? By our standards, yes although Dave didn't get the impression that Russions find it dreary. (All those women in cotton stockings drab things up considerable, he says with red-blooded Americanism.)

INTOURIST, their travel agency, is efficient. It takes you **to** your train, from your train and to your hotel. From there you're on your own. Where you go and how you behave are dictated mostly by your own common sense.

You travel on an itinerary which you set up beforehand. Dave felt no sense of surveillance (although his bags may have been gone through in one hotel), and nobody stopped him from taking pictures.

Were Russians friendly? "Yes, they were—although apprehensive." They were much more willing to talk with him informally than to be seen together in public, say for dinner.

Intourist tries hard to impress the guest. Dave was seated at a restaurant table when a man came along and sat down at his table. The hostess came over and ushered the fellow to another room. Dave felt they must be afraid he would corrupt the Russian with Western ideas; but it turned out they'd yanked the man because he wasn't wearing a necktie; he was "nekulturny"—uncultured. In his place they seated a woman architect and her contractor husband. They were "cultured" and thus fit companions.

NEWS is heavily slanted to further the government's goals. Stories seem to paint President Kennedy as a (relatively) good guy, but in danger of being pushed into rash action by the bad guys (certain congressmen).

Despite the state goal of a classless society, class differences exist. Status symbols are not monetary, but rather: Ability to get roomier housing; a medal, or even a photograph with Khrushchev.

There are fewer Russians than most people think. Strictly speaking, Russians are only those who live in a certain geographical area—roughly corresponding to the old Czarist Russian state. A person from the Georgian republic, in southern USSR, will call himself a Georgian, not a Russian. And a Jewish person may say he's a Jew and not a Russian.

Russian workers get a month's vacation each year, and free medical care. Medical facilities are abundant, and of high quality, Dave believes.

Housing is very crowded; as many as four families may share a three-room apartment. This is one reason you seldom get invited to Russians' homes: The other families may not approve.

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