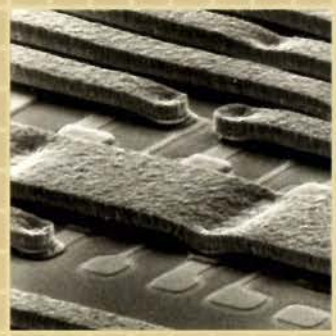
TEKTRONIX, INC./ANNUAL REPORT
37TH YEAR/MAY 28, 1983



Tektronix
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SHAREOWNERS' MEETING

The annual meeting of shareowners of Tektronix, Inc., will be held on Saturday, September 24, 1983, at 9 a.m. Pacific Daylight Time, in the Assembly Cafeteria Building, S.W. Karl Braun Drive, Tektronix Industrial Park, near Beaverton, Oregon.

Exchange Listings:
New York Stock Exchange
Pacific Stock Exchange

Transfer Agent and Registrar:
Morgan Guaranty Trust Company of New York, New York

Indenture Trustee:
Citibank, N.A., New York

Corporate Office:
Tektronix, Inc.
4900 S.W. Griffith Drive
Beaverton, Oregon

Mailing Address:
Tektronix, Inc.
Beaverton, Oregon 97077

Telephone:
(503) 627-7111

Tektronix 1983 Income Highlights in thousands

52 Weeks to May 29, 1982		52 Weeks to May 28, 1983		Increase (Decrease)		
$1,221,000	**100%**	**$1,124,000**	**100%**	**$(97,000)**	**−8%**	**CUSTOMER ORDERS,** some of which were
321,000	26%	253,000	23%	(68,000)	−21%	UNFILLED ORDERS at year-end.
$1,195,748	**100%**	**$1,191,380**	**100%**	**$ (4,368)**		**SALES REVENUE comprised of**
567,994	47%	526,681	44%	(41,313)	−7%	INSTRUMENT products,
441,420	37%	455,336	38%	13,916	3%	DESIGN AND DISPLAY products, and
186,334	16%	209,363	18%	23,029	12%	COMMUNICATIONS products—sold to
729,369	61%	734,223	62%	4,854	1%	UNITED STATES customers, and
466,379	39%	457,157	38%	(9,222)	−2%	INTERNATIONAL customers.
14,470	2%	12,601	1%	(1,869)	−13%	OTHER REVENUE from non-operating sources.
$1,130,765	**95%**	**$1,155,267**	**97%**	**$ 24,502**	**2%**	**LESS COSTS AND EXPENSES** to be paid
581,269	49%	613,637	51%	32,368	6%	TO EMPLOYEES who design, produce, sell and service products or who support their efforts;
436,726	36%	448,807	38%	12,081	3%	TO SUPPLIERS for materials, components, supplies, services and the use of their property and funds;
56,297	5%	26,113	2%	(30,184)	−54%	TO GOVERNMENTS as taxes in the United States and abroad—and to provide
56,473	5%	66,710	6%	10,237	18%	FOR FACILITIES depreciation which allows for the use, wear and aging of buildings and equipment.
$ 79,453	**7%**	**$ 48,714**	**4%**	**$(30,739)**	**−39%**	**RESULTING IN EARNINGS** to be reinvested in the business and for dividends to shareowners.
$4.25	**100%**	**$2.57**	**100%**	**$(1.68)**	**−40%**	**EARNINGS PER SHARE** based on average shares.
.98	23%	1.00	39%	.02	2%	DIVIDENDS PER SHARE paid to shareowners.

Tektronix Business

Tektronix' business is to develop, manufacture, sell and service electronic measurement, display and control instruments and systems that are used worldwide in science, industry and education. Since its founding in 1946, Tektronix has played a major role as a supplier of tools that contribute to the advancement of technology.

You can grind your teeth and tough it out — but only for so long

The most anguishing part of the year was having presided over an employee layoff, and having let people down who were counting on us.

However, the financial pages also fail to reflect other aspects of our year. And those are *positive* aspects. To make sense of that year, you'll need a balanced picture of the things that went wrong and the things that continue to go right. In some cases that picture involves long-term programs whose effect can't be foretold, so it may not be crystal clear. But we'll do our level best.

For now, may we give the good news equal time:

MAKING IT THROUGH 1983

That dill-pickle look on your face says you have just read our Highlights, as they are euphemistically called. They once again reflect a tough year. Our earnings took a pasting.

It was a disheartening time in many ways, and figures can never convey them all. The year before, we had tried hard to hold our workforce together until things picked up. To that end we used a mishmash of options, including shutdown days and weeks and allowing inventory to grow past prudent bounds. But we ran out of options before we ran out of Recession.

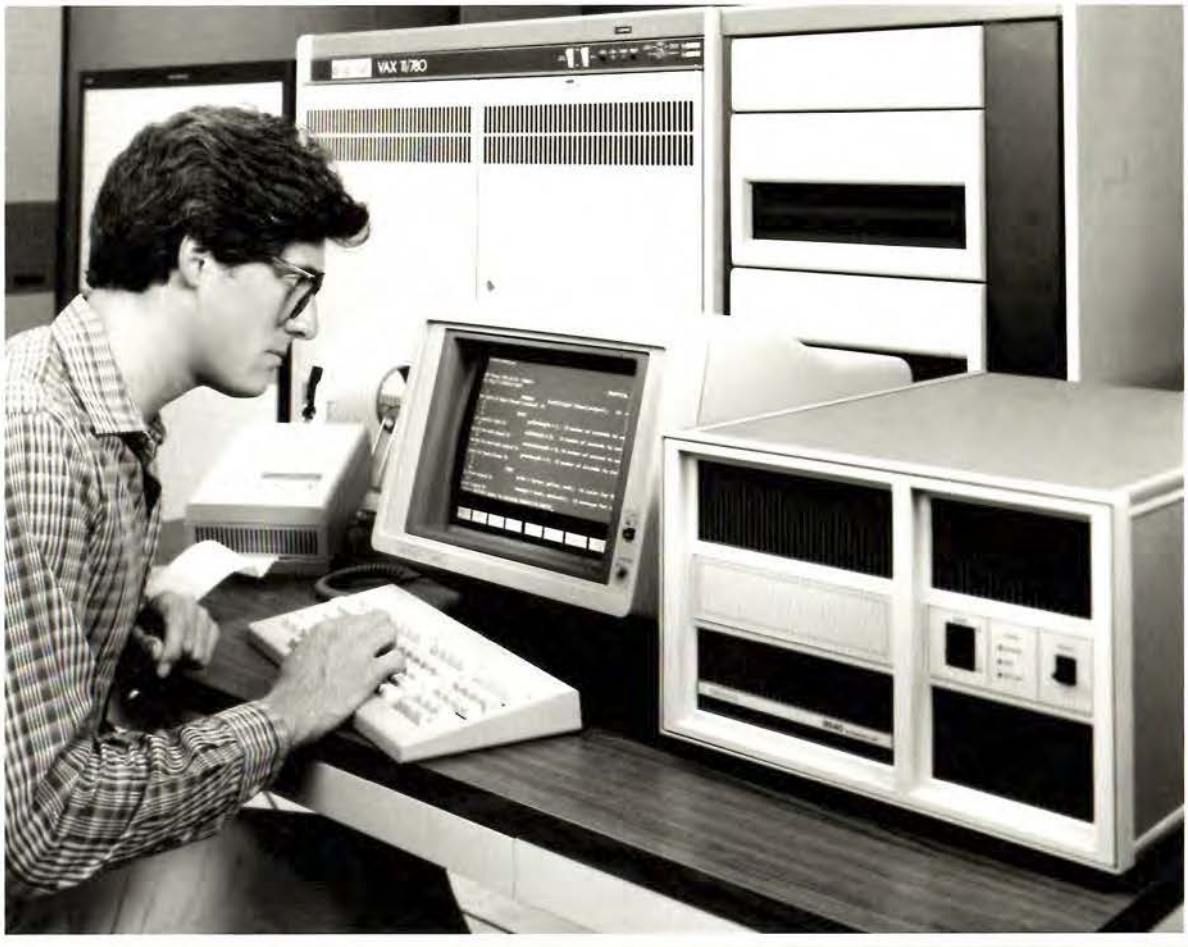
At first, our president comments, you figure you can just grind your teeth and tough it out. But after awhile, that no longer works. For one thing, he adds, you have no teeth left.

The Right Stuff

We are working our way through hard times, with innovative products founded on formidable technology.

We've long been one of the world's technologically richest companies, never more so than this year. This is high-Tek.

Dispensing Technology — Our advanced research group is no ivory tower. Coupled ever more tightly to our businesses, it supplies them not only with sophisticated components but also with training, to bring their engineers up to speed on latest techniques.



TEKTRONIX' 8540 software integration unit (right) now can be used with Digital Equipment VAX computers. Our new 4105 terminal, shown here, provides the only color user interface offered by any microprocessor software development system.

It would be easy to become awash in technology, with more promising avenues than we could ever pursue. Our choice used to be: Invest in it, or drop it. Now we have ways to keep our technology and share it, too. We are developing new means of sharing the cost and effort of technological or product development, including through joint ventures.

We also will pump technology out into the world through what may prove to be among the most significant ideas of the year: Strategic Program Units (SPUs) will exploit specific product or technology avenues, in a more free-wheeling way than through our traditional Tek business structure. This report describes several SPU activities.

The Best Product Line in a Long While—A year ago, our Information Display Division was eating the dust of competitors, who had gotten into color raster displays ahead of us. Our portable oscilloscope line was growing old, and that market was threatened.

This year saw resurgence of IDD with both low-end and high-end products. It is making a strong run to regain its lead in the graphics market. And our new family of outstanding Tek portable scopes has set new performance marks for the industry.

In explosive newer markets, we extended our lead in logic analyzers, and continue to run up front in microprocessor development systems.

The best year ever for The Grass Valley Group underlined its pre-eminent worldwide position in high-quality TV switching, routing and transmission equipment. Other new television products brought heartening early sales.

Long-established products also did well. Spectrum analyzers gained ground on the leader; we're an ever closer number 2. A state-of-the-art version of our semiconductor test systems has pushed that venerable product line to the forefront of advanced VLSI testing. In oscilloscopes, our laboratory products (even those 10 years old) now can become digital scopes overnight, thanks to a new digitizer plug-in.

ALL THE pieces at left can be assembled in nine minutes, using only 10 screws, into the 4105 color terminal, shown by members of the project team.

Quality, Reliability, Buildability all up. Quality increased—modestly, as it should. A large increase would point to something having been really wrong. Thorough customer surveys (and our own picky audit of outgoing products) affirm that our quality exceeds that of competitors.

We stand behind our product reliability, with we believe unmatched warranties on portable scopes (three years) and graphics terminals (one year).

And, despite their complexity, our new products are getting easier and easier to build. We can assemble a terminal before you can read the next four pages.

The 4105's versatile display stand tilts, swivels, glides and elevates to suit the user's preferences.

OUR INSTRUMENTS Division, like the rest of Tek, is making increased use of computer power in its design work.

FABRICATION OF integrated circuitry requires painstaking care.

Running Short of Shortages. Last year, shortages of Tek-made components were a source of embarrassment and product delays. This year you don't hear of many — a dramatic turnaround in quality and delivery.

The Subdividing Company — We continue the decentralizing process. Central groups are being dissolved, and divisions themselves are now subdividing into business units. It is clearly the way to go. Where it is farthest along, we see more and more signs of improved productivity, better morale, clearer sense of direction, stronger customer awareness and creative business approaches.

Our manufacturing resources planning (MRP) program, a massive system of meticulous disciplines, moved further toward completion. Where it has been put into place, we see improved efficiency; this year MRP enabled one division to free up $25 million through better management of work-in-process inventory.

Financial Strength — We are a financially robust company. Our cash flow is positive; we have relatively little debt; our balance sheet is strong, our assets impressive. We are poised to grow fast once the chance comes, with ample capacity in first-class plant and equipment. Despite flagging sales, we've substantially increased our investment in engineering and research.

Rough Times are Themselves a Plus — They provide a crucible in which to temper and toughen our mostly young divisional and business unit managers. What better, more rigorous training ground could you want?

If We're So Smart, Then Why Ain't We Rich?

None of which in any way disguises the year's unsavory financial figures. In the sedate language of annual reports, these are what you usually call "disappointing" results. That wasn't the first word that came to mind, however.

Poor forecasting played a great part. To predict the economy is hard, and you have little real help. As past years attest, you can get about equally good advice from your economist or your barber, but at least the barber gives you a haircut with the forecast.

No one would go about making economic predictions unless he or she had to. But companies have to. That is, somewhere along the line, they must put their money (and shareholders' money, and people, and materials) where their mouths are, and prepare for whatever direction they expect the economy will go.

We have never gotten the hang of it. We were off quite a bit last year and the year before. But those turned out to be just practice swings; this year we *really* missed it, our orders falling $300 million short of what we had counted on.

It's one thing to admit owning a cloudy crystal ball. It's another to describe the damage a bad forecast can do. For one thing, it makes a lot of the other numbers look bad.

For example, having made over $1 billion in sales is nothing to apologize for. But when you figure that we had armored up to fill 20 percent more orders than we got, you can see the costly overcapacity that resulted.

We forecast by asking each Tek business to make its best assessment of markets and product potential. Then our collective economic intelligence (which may be a contradiction in terms) turns into an internal forecast on which we base our planned expense levels.

An off forecast results less from trusting economic "experts" than it does from the natural tendency in a growth-oriented company toward optimism.

But by mid-year it became clear that the economic brightening we had kept "seeing" for over two years was not due to a light at the end of the tunnel. It was just that our eyes had gotten used to the dark.

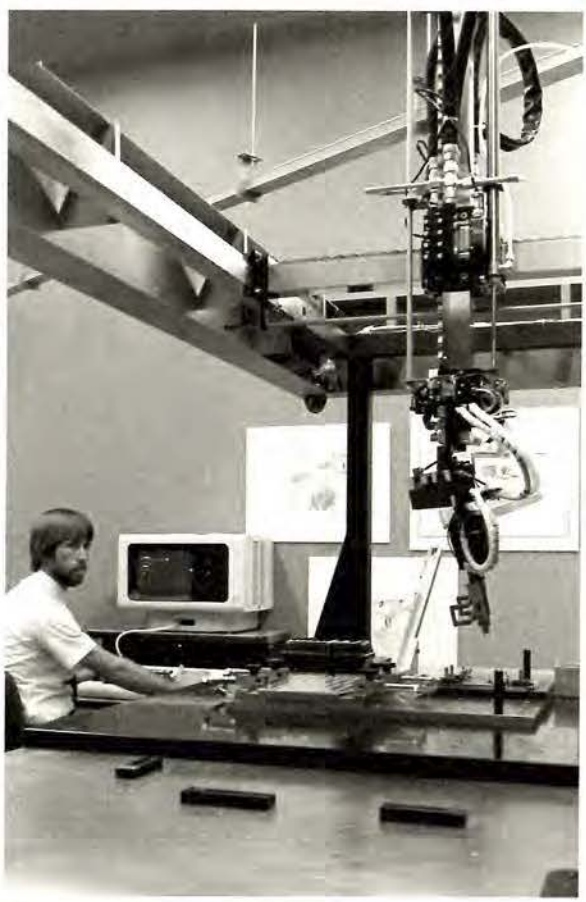
The worst of it is that *earnings* were down 39 percent, to $49 million from $79 million last year. *Earnings per share* fell to $2.57 from $4.25 a year ago, a 40 percent drop. (Our early retirement program accounted for 59 cents of the $1.68 decrease.)

Sales, considering the soggy economies of the world, were respectable: $1.2 billion, essentially flat. The *US portion* moved to $734 million from $729 million; the *international segment*, to $457 million from $466 million.

These were the contributions to last year's net sales for the products of our three operating groups, as well as to sales for other recent years:

Instrument Products		
1979	$435,108,000	55.3%
1980	$504,380,000	51.9%
1981	$507,630,000	47.8%
1982	$567,994,000	47.5%
1983	$526,681,000	44.2%
Design Automation and Information Display Products		
1979	$242,745,000	30.8%
1980	$327,078,000	33.7%
1981	$391,149,000	36.8%
1982	$441,420,000	36.9%
1983	$455,336,000	38.2%
Communications Products		
1979	$109,083,000	13.9%
1980	$139,848,000	14.4%
1981	$163,055,000	15.4%
1982	$186,334,000	15.6%
1983	$209,363,000	17.6%

In a growth-oriented company, there's always a tendency toward optimism



EXPERIMENTAL USE OF robotics in our Instruments Division seeks to elminate jobs that are monotonously repetitive.

Incoming orders went limp, sagging to $1.1 billion from last year's $1.2 billion. That was a decrease of 8 percent.

Unfilled orders at year's end stood at $253 million. Last year they totaled $321 million.

Part of the drop in earnings resulted from our decision to increase our engineering expense from 9.1 to 10.5 percent of sales. We intend to continue a high level of R & D funding this year.

The $30.5 million for our early retirement program also subtracted from earnings. The optional program was elected by 783 of the 994 eligible employees. The dollar total represents the actuarial cost of pensions to be paid these people from now until the date they would otherwise have been eligible to retire.

Other drags on earnings were unplanned. Cost of sales was termed "acute" last year—no, that was *two* years ago; last year it went up past that. This year, while orders fell off, fixed costs remained fixed; so cost of sales went up one more time, from 50 to 52 percent of sales.

HIGH-VOLUME cathode-ray-tube line has dramatically reduced production time and increased tube yields.

Part of that increase resulted from obsolete inventory. Our warehouses had not emptied themselves of our older products by the time this year's new models came on board. Additions to inventory reserves for obsolescence were $14 million higher than last year's.

Administrative costs went up by 11 percent.

On the cheerier side, interest expense went down. We also got a break from lower income taxes, including research and experimentation tax credits.

Tectonics, Inc.?

The earth's crust, it has been reported, sits on top of several supporting "plates" that are slowly moving in different geographic directions. Students of what's called plate tectonics reckon that this motion, if you just give it enough time, will plunk San Francisco up alongside Alaska and make citizens wonder which state to vote in.

The worst trouble occurs along the fault lines, where one plate grinds against another, causing earthquakes and aftershocks.

This report is about Tektronix, not tectonics, but there are some similarities. And this year we have had our share of quakes and shocks.

We have never seen so much change going on at Tek: More change, more *kinds* of change, more-*major* changes. And they are non-synchronous. Our MRP program moves ahead on one timebase. Divisionalizing progresses on another. Technology accelerates. New production methods change the shape of jobs. . . .

And the changes may appear to conflict. One goal of MRP is to provide *consistency* in reporting; one goal of divisionalizing is to enhance *individuality* in business management. When these tectonic plates grate, at the fault lines, it is easy to get shaken up.

SILICON WAFERS in the oven during fabrication of integrated circuits.

To suggest that we expected all these out-of-sync changes to take place in an orchestrated way, to the wavings of the maestro in Beaverton, would be to mislead you.

Anchor Points are Elusive

Rock-climbers anchor three points (say, one hand and two feet) before moving the fourth. Today at Tek, *all* is change; it's sometimes hard to find two anchor points, or even one. (Still, the changes must be made; but they can sure make you grit your teeth.)

There is great need for reassurance; we have tried to provide it. There is also great need for consistent manager communication; we haven't done as good a job at that. It's hard to communicate well when you're gritting your teeth.

The above is our way of saying that we realize it has been a very jittery time. We intend this year to do a better job of communicating, so our people will feel less like change victims and more like change *agents*.

Costs Get Out of Hand

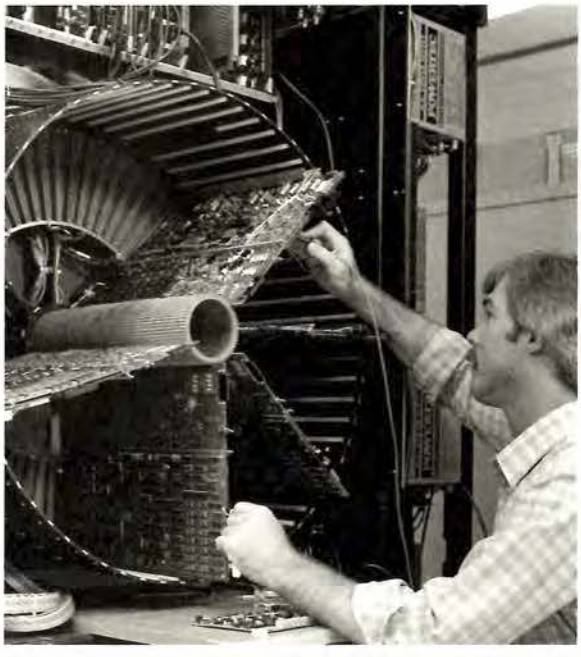
Another fallout of the multi-change environment has been a disturbingly sharp increase in overhead—our least favorite way to spend money. The increase probably shouldn't be surprising; we have told you in past reports that the first few years' effect of MRP would be high expenses. We noted also that decentralizing was bound for a time to result in costly redundancy. Yes, we did say those things—but apparently we weren't listening. The increase still surprised us.

ASSEMBLY of OF150 fiber-optic cable tester, which has been widely adopted by telephone companies and others.

We've found it easier to dissolve centralized functions than to do away with the centralized mind-set. Now and then, no sooner has the central group been subdivided than a suspiciously bureaucratic-looking cluster of staff has formed in the new smaller unit.

These people additions, we hasten to say, are for good purposes and meet stated company goals. But, with the desire to do the new job well there sometimes comes an appetite to do it the nicest and best way.

There *is* a duplication of functions. Our old MRP system *must* keep running until the new one is fully in place. Our central groups *must* provide vital services until divisional ones can take the baton.



PROTOTYPE model of S-3295 semiconductor test system is used at Tektronix for engineering software development. System is one of few products able to test high-density "superchips."

So the changes are costly. Does that mean the programs were unwise? No. They are *essential* things to do, if we are to become the company we expect and intend to be.

We're going through what one vice-president calls "Cycling through the whoops!es." It's much like the design of an instrument. The first version has bugs in it. So the time arrives for what we call "tweaking." Some redesign here, a more-efficient process there, a different component... Sooner or later a Tek-quality product emerges.

So it is that our MRP, our decentralizing, our advanced computer systems all are going through the tweaking stage. That will mean a hawk-eyed relook (as our managers have been informed) at just what is essential and just how fancy it need be. A do-without bias is not a bad attitude, for starters.

There is nothing elegant about the tweaking process. But we have found it to be pretty darned effective. And we expect it to yield an organization that is itself a Tektronix-quality product.

Trying to Forget a New Word

We want to purge our vocabulary of the word "layoff." We've always viewed that practice with distaste. Living with it this year has only reinforced our feeling. The idea that having done it once might make it easier the next time is not valid. It is an undesirable practice. We would prefer to forget we ever knew the word.

Our layoffs, which began in October, had affected 1,613 employees by year's end. Of them, 766 found other jobs at Tek.

Management textbooks be hanged; there's nothing scalpel-sharp and surgically clean about layoffs. At Tek, where employees receive not summary dismissal but time in which to seek other work here, the process tends to be a lingering and sometimes painful departure. It is hard on the people, on their well-wishing co-workers — and probably on morale. Those who did find new jobs here, however, probably appreciated the grace period.

One pressure toward workforce reduction is unavoidable: Increased automated manufacturing and testing mean our newer products will require fewer labor hours than our older ones. We have no choice in this matter. In a world of shrinking margins, we must continually improve productivity. And, over the long pull, it is a plus. It makes our products more affordable, increasing their sales and thus our total employment.

As Tektronix divisionalized, most employees kept their jobs or found new ones. But not all; for some, the process may have felt like losing at musical chairs. Some with longer tenure, who had invested many of their years in their existing jobs, found suitable new work hard to find.

To enable them to pursue work or personal goals —and to provide a needed reduction in payroll— we offered early retirement. Employees at least 50 years old who had 20 or more years' service (and those who retired during calendar 1982 and met those criteria) could choose the option. Of them, 783 took the opportunity.

The full cost of the program ($30.5 million) must be charged to this year; so its first effect is entirely on the expense side. But over the years we expect that the reduced payroll will mean a net savings.

It was a much-deliberated decision. Those 783 people represented more than 19,000 years of Tek experience. That can be measured. What can *not* be measured is the collective impact they have had on Tek —or the effect on us of losing their cumulative experience.

We could go on and on about many of them; they'd been here a long time, and we know most of them well. They have been our friends, our coworkers, our managers, our teachers, in many cases our role models. Tek will be a different place without them.

Including layoff, early retirement and normal attrition, our employee total dropped to 21,078 people, from 23,231 at the end of last year.

INTRODUCTION OF advanced 2000-series portables was an intense learning experience, even for old hands at scope sales. Above, assembly of the state-of-the-art 2465 portable.

We're beginning to ask of suppliers the same standards we ask of ourselves

YOU CAN'T AUTOMATE the intricate hand work required for harness wiring of a Grass Valley 1680 series production switcher. Complicated task takes many skilled hours.

The Hardening Nose

As we drew a bead on Tek-made-parts suppliers — asking 100 percent quality, on-time delivery — some outside vendors got caught in the sights.

We've now begun to ask those standards from outside suppliers of common-usage parts also. The results are increased quality, better deliveries and reduced manufacturing costs.

And it has meant the near-death of an old saw that says never to rely on a single source of supply. (That adage may have begun in a speech to some local purchasing association, accepted as gospel because the speaker was from out of town.)

We now find we have had hordes of suppliers for even garden-variety components. That's bound to cause dilution of quality; it's sometimes hard enough to find *one* who is competent. As a result, we were routinely accepting faulty parts. (We even, in a helpful way, once set up an inhouse group to repair the bad ones.)

Our supplier list went on and on, with more than 2,500 names. We're whittling away at the number by selecting only the best. We're less tolerant of late or flawed deliveries, and we tend more toward single or limited supply sources.

Quality standards have toughened. If you can make one part right, you can make 1000 parts right, we always say. Whatever their reaction to this and other folksy mottos, most suppliers *like* the new relationship. (Not all, of course; one told us we were crazy.)

We were devoting a huge warehousing area to office supplies, all neatly tagged with Tek part numbers. Now a single source provides almost all of them, and does the warehousing instead of us. We've done the same thing with abrasive materials and cutting tools. On-hand supplies of packing materials will be reduced 80 to 90 percent.

Thanks in part to this stockless purchasing program, we've vacated great amounts of warehouse space. More will be emptied.

NEW 110S frame synchronizer, our Television Products business unit's first signal-processing product, outperforms the present industry standard in head-on comparisons.

FIBER OPTIC cable is connected to this board. A laser diode sends light down the cable.

Back orders are now only a third of what they used to be. And quality level has improved; it's easier to find one or two good vendors than to assure quality among a half dozen. Also, we now have time to develop good solid relationships.

The result has been that our customer-supplier relationship has a partner feel to it.

That relationship is based on trust. We share with vendors sensitive information on parts needs, and a "rolling forecast" of our requirements, so they'll know what's coming. We maintain one another's information in strictest confidence.

Our 100 percent quality program has four steps:

1. We make sure we and the vendor are using the same specifications.
2. No specs are changed without an agreement.
3. All quality or delivery problems are resolved *immediately*, and the root cause eliminated so they won't recur.
4. Suppliers then receive Tektronix accreditation.

By that stage, we will expect weekly deliveries directly into manufacturing, with no need for redundant incoming inspection.

A Key Supplier Program (50 top suppliers included) includes regular half- to full-day performance reviews, preferably with suppliers' top management. In these reviews, vendors see where they rank among the 50 and how they're doing as to quality, promptness, responsiveness and recurrence of problems.

They, not we, set their goals; all we ask is continuous improvement. They, not we, do the preconditioning and testing of parts and materials, to our standards.

Why should suppliers be happy with our harder-nosed attitude?

1. Our confidence in their quality assures their business.
2. They get larger orders than when we parceled our business out.
3. Meeting Tek standards is a marketable credential; suppliers can use it when they seek other business.

OSCILLOSCOPE testing area, Vancouver, Washington.

THE FAMILIAR MARKETPLACE

Over its history, Tektronix has changed. Its products have increased in both number and sophistication. And the technological world has moved with boggling speed.

But our mix of customers is about the same. Of course, there are more of them. We have over 50,000 commercial customers, none of them dominant; no one commands as much as 4 percent of Tektronix' business.

Our major product remains the cathode-ray oscilloscope; we've led the world in scope performance from the first model we built; and in scope sales for all but our startup years.

But Tek products have moved in many directions beyond that. Some were extensions of oscilloscopes; they eased their way into our product line either as plug-ins for our lab models or as specially designed scopes — such as spectrum analyzers, logic analyzers and TV waveform monitors. Others were outgrowths of the display technology developed to support oscilloscopes. A spinoff from storage-scope CRT design resulted in our extensive line of graphic terminals.

Other Tek products have not evolved from, but been added to, our oscilloscope base. Key among them are microprocessor-development products and other software design aids, and TV production and routing switchers and special-effects equipment.

We are one of the world's two largest makers of test and measurement products. Typically our products lead their markets; second most typically, they are runners-up.

As noted, the makeup of our customer base has changed only a little. Broadly, our high-technology tools are used worldwide, throughout science, industry and education — to do research, or to design, build and test things.

Tektronix directly serves customers in all major Free World nations, and is represented in 48 countries with smaller markets by 51 commercial distributors.

The US accounts for about 60 percent of our sales in a given year. The rest are made to other countries. They are principally France, The United Kingdom, Japan, and Germany, followed by Canada, Italy, Switzerland, Sweden, Australia and The Netherlands. That ranking jiggles around from year to year, but those are usually the front-runners.

CIRCUIT BOARDS are inserted and tested in the pedestal of our 4115B color graphics terminal.

NEW OF150 fiber-optic cable tester completes its final assembly in Tek's Communications division. Below, testing of a portable spectrum analyzer.

Who Uses What We Build?

Manufacturers of electronic and electrical equipment make up our biggest customer segment. These companies build a wide range of products; it includes telephone and communications equipment, aerospace equipment, industrial controls, home appliances, radar systems, radio and television sets, and the like.

The computer industry is the second-largest segment. These companies design and build mainframe and smaller versions — mini and microcomputers — and their peripherals.

Governments, taken together, are our third biggest market. Typically they buy our standard commercial products. The US government is the largest of these; but foreign, state and smaller units also make wide use of what we produce.

Education is the next segment: universities; medical schools; vocational and technical institutions; graduate or other investigative laboratories, and general classroom use. There is more electronics, less chalk, in the classroom today.

Instrumentation companies (we are an instrumentation company) are the next-largest customer group.

Then come broadcast and other kinds of television, including commercial and industrial cable and closed-circuit systems.

The list goes on. It encompasses all human industrial, scientific and educational purposes. Significant customers include petroleum and other energy producers; chemical companies; transportation agencies; printers and publishers, and the medical field.

The biggest changes have been to serve the recent growth in digital (usually computer-related) applications; and the rise of software design to an equal footing with hardware design.

CONTINUING POPULARITY greeted our 492 portable spectrum analyzer this year. Its rugged high performance has made it a favorite of military and other users that offer a rough environment.

Basic Electronic Tools

Our major product, a ubiquitous one, is the oscilloscope. It graphs the time versus the amplitude of some event within an electrical circuit. Its CRT phosphor screen displays a waveform caused by focused electrons hitting it with great force. The display allows study of pressure, velocity, nuclear phenomena, heat, strain, sound, biological signals —anything that can be converted into an electrical waveform.

Scopes differ in bandwidth (how wide a range of signals they can measure) and sensitivity (how small a signal they can detect). Readout on the CRT screen has made them increasingly useful; so has addition of "intelligence" by using microcomputer chips or being coupled to a computer; both enable added analysis of waveform data.

In our broad oscilloscope line, our larger lab-bench models can vary their performance by adding and mixing up to four of a wide number of interchangeable plug-ins. Our portables range in size, down to ones you can hold in one hand while you operate them. Portables have fixed performance, no plug-ins. The top of our portables line encroaches on lab-scope capability.

Plug-ins for lab models include amplifiers to expand either the time or the amplitude segments of the display. That enables the scope to acquire a wide range of signals. Plug-ins also include multimeters, counters, both spectrum and logic analyzers, and digitizers.

Some storage oscilloscopes contain Tek-designed CRTs that retain the written image on the screen. Others store by breaking a waveform into digits, stashing them away and then putting them back together in a replica of the signal.

Other test and measurement products include programmable and manual modular instrument systems, data communication testers, spectrum analyzers, pulse generators, amplifiers, logic analyzers, semiconductor curve tracers, microprocessor development aids, optical and electrical cable testers, and power supplies — plus accessories including probes, attenuators and waveform cameras.

Information-display products include graphic computer terminals, that display pictorial as well as verbal data, in monochrome or color; graphic computing systems, which function as desktop computers or interact with a host computer; hard-copy

Matching computer terms to products makes for high performance

units, which make paper or transparent copies of CRT screen contents, in black-and-white or colors; display monitors, and digital plotters.

Some of our terminals and all our computing systems are "intelligent." That is, they incorporate or tap into computer power.

Some of these are raster-type, rewriting the image all the while it is being viewed, as on a TV set. Others use the tube itself to retain the written image; these are capable of extremely fine-line resolution.

Specialized products for use in the television industry are waveform and picture monitors, signal generators and vectorscopes, all of which test and display the quality of video transmission; and frame synchronizers. The Grass Valley Group, Inc., our California subsidiary, builds production and routing switchers, special-effects systems and signal-transmission equipment.

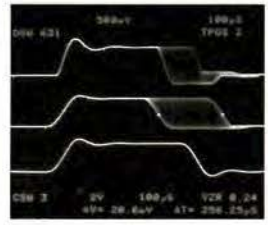
Custom-Tailoring the Parts

Often our products attain their high standards because of Tek-designed and built components. Many of these are high-technology ones, such as the integrated hybrid circuits that enable the high performance of our new 2400 portables. Others are lower-technology but done with extreme attention to our unique needs.

High-tech or low, being able to design components to match a product's needs (as well as configure the product to take full advantage of component design) has led to exceptional performance.

Other reasons — including lack of outside suppliers — also have added to our heavy vertical integration. However, supplier availability is changing. So is our outlook on what we should build and what we should buy. We're cutting down on our number of in-house functions, such as routine metal-bending. We'll keep those that cost too much outside or require that the supplier be close enough to the product to know just the kind of component it demands.

We build cathode-ray tubes (except for raster-type); integrated circuits; thick- and thin-film hybrid circuitry on a ceramic base; etched circuit boards; transformers; precision capacitors and resistors; inductors; relays; oscillators; coaxial cables; waveguide mixers; some semiconductors; some phosphors, and a wide variety of plastic and metal parts, many of them unique to our products.



ANY TEK LABORATORY oscilloscope can now be instantly converted to digital use by inserting our new plug-ins. The 7D20, shown here, was designed for use with 7000-series lab scopes. Above, its "envelope" mode, setting the bounds for go/no-go tests, allows less-trained people to use the 7D20's capabilities.

SHARPENING THE COMPETITIVE EDGE

Among the things that make sales are (1) A kitbagful of new products; (2) Built-in long-term product value; (3) A trained sales force that hustles, and (4) A stout economic wind at your back.

This past year our sales held just about level. Level doesn't mean up, of course, but that still was a creditable showing in a time when the world's economies were going, at varying rates of speed, to pot.

That we *did* maintain sales level was due mostly to numbers (2) and (3) above. For there was no wind; the markets seemed becalmed. And, in general, other companies had very competitive products. But our highly trained and now-divisionalized sales force, aided by our traditional product value, held the line. It takes more than just being new to supplant a Tek product.

The coming year we'll be better off.

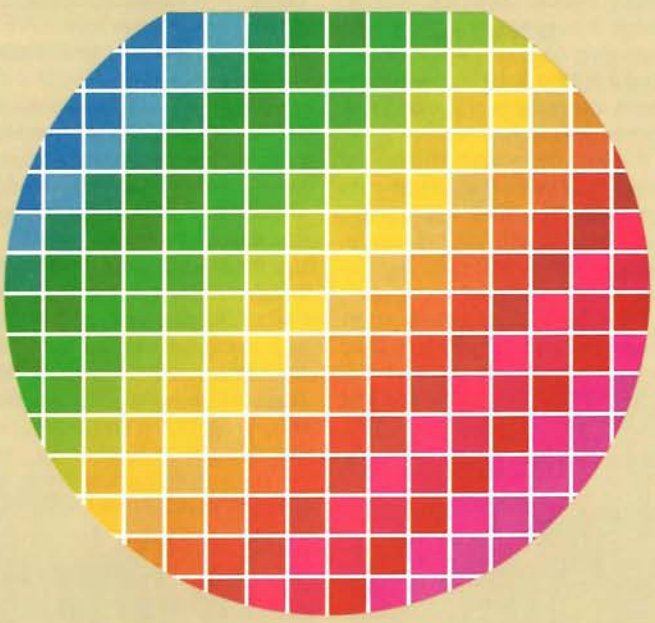
We now offer the market our newest and strongest product line in several years. We have underlined our leadership in oscilloscopes with a superb new portable family. We have come back strong in information-display products, offering superior price/performance at both the low end and at the frontiers of color display. New Tek and Grass Valley television products are exciting the broadcast industry. And new logic analyzers show that the Design Automation Division does not intend to loosen its grip on its leadership position.

Also, there are signs of an upswing in the US economy. Or we *think* so. But then, you know us and our forecasts.

The following 16 pages describe and picture the year's new products, as well as other aspects of the virtuoso technology that made them possible.

FINAL TROUBLESHOOTING of S-3295 semiconductor test system prepares it for shipment.

A BROAD LINE OF PRODUCTS
A FULL SPECTRUM OF TECHNOLOGY



The Wizardry of IDD

When the horse showed up at work at our Wilsonville plant, it might have seemed unusual. But it was disguised as a unicorn, so people took it in stride.

Unicorn mania infused the place this year. "Unicorn" is our code name for our Information Display Division's new line of low-cost, high-performance color terminals. They are helping spearhead Tek's strong comeback in the graphics market. There were Unicorn bumper stickers, Unicorn T-shirts . . . So when the real item showed up, it fit right in.

The Unicorn provides one prong (so to speak) of IDD's bid to reassert leadership. It serves the low-price end of the market.

Creating equal excitement at the high end is our state-of-the-art 4115B terminal. It offers the finest color graphics available in the world.

And, to make both lines of terminal fully useful, we have brought out two models of advanced color inkjet copiers.

Response to all these products has been first-rate — beyond our rosy expectations.

"The Giant (meaning us) Prepares to do Battle" read a typical trade-press headline. That pretty much tells the story, except it suggests the giant had been spending some time twiddling his thumbs. The headline needs a few more words: "With Better Weapons."

We *had* been twiddling *one* thumb. As we reported to you last year, we had lost some market share to other tube technologies, thus sliding to a position of catchup.

With this year's top-to-bottom refurbishing of the product line, we have *more* than caught up. We once again set both the price and performance standards for the graphics market.

Our loss of leadership was due to a combination of (1) a Tek storage-tube technology that led a longer profitable life than we had expected; (2) the resulting wishful thought that it might even be immortal, and (3) quality problems at a crucial time.

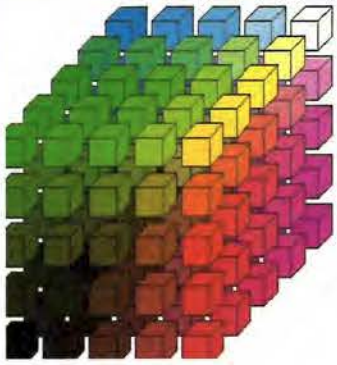
Tek really created affordable computer graphics with its introduction in the '70's of inexpensive terminals using the direct-view storage tube (DVST), whose phosphor screen retained the images.

Our DVST products enabled low-cost, high-performance monochrome graphics. Competing raster-type tubes, which required continuous rewriting of the display, cost too much to operate and gave less-sharp images.

Raster got better and quite a bit less expensive. But our DVST technology got better, too: Brighter, sharper, larger-screen.

Raster probably would have encroached on DVST slowly had it not been that the market began to want color graphics, which our storage tube didn't provide. So, we did do some work on raster displays. But the demand for our DVST products continued high, particularly OEM sales (to other companies, to be built into their products). So our own raster effort putted along, is all.

"UNICORN" FAMILY of low-cost, high-performance graphics terminals begins with the 4105 (second from left.) Other members will be the 4107 (left) and the 19-inch 4109. At right is our 4170 graphics processing unit, which enables the terminals to become stand-alone graphics computers. Our 4695 inkjet color copier is in front.



COLOR COPY made on Tek 4691 inkjet copier from a CRT display.

We recognized the color threat, and made some guesses as to how fast it would overtake us. But we called it wrong. In a market that wanted color raster, our strength remained in black-and-white DVST. Demand (particularly OEM) dropped fast. We even helped it along by running into a spate of bad luck: Severe tube yield problems caused long delivery delays. Our drop in DVST orders turned into a plummet.

That's the oft-told and sad part of the story. However, we were in a stronger position than it looked. We'd done many *right* things in our early days:

We had built a large installed base of Tektronix products worldwide; we'd made all our IDD products compatible with one another; we had developed strong customer loyalty; we'd developed the industry-standard software; we'd added excellent hard copiers early on; we had built the world's largest and most knowledgeable graphics sales and service network; we had focused on a market we knew well, engineering and science; and, with years of CRT circuitry experience, we knew the display field like few other companies.

So our strong rebound shouldn't have been a total surprise. What some Monday-morning technical experts portrayed in the trade press as the demise of Tek graphics was really a pause (however embarrassing) to retrench.

All our new products are compatible with each other and with preceding Tek models, making it tempting for a user to upgrade.

Copies: The Missing Link

Tek realized early that being able to make hard copies of CRT screen contents would be desirable in most applications — and essential in many.

The major drawback to using color terminals has been that most copiers do poor work — producing marginal quality. We believe that ink-jet technology will provide the best solution. So we have added two superior ink-jet copiers that give high-quality, fast, cost-effective color copies on paper or transparency.

Unlike other means of copying — pens that scritch up and down across the paper or impact printers that stamp the image in colored dots — ink-jet copiers move the paper past the ink faucets, which paint the image.

Impossible Mission?

The Unicorn project had many "impossible" goals — hence its name, for the elusive mythical beast. They included producing a very high-quality color display—and making color easy to use, something no company had figured out how to do; making the products compatible with the rest of our line; hitting a tight deadline — and coming in with a price of under $4,000.

Impossible goals are generally met, since they tend to raise adrenalin levels. We hit all our product-development targets (despite early troubles; our environmental chamber ran amok and melted down our first model).

Buildability is excellent. We tried to make the Unicorn a snap to assemble — literally, figuring out ways to do away with screws and have the modules snap together. We came close; it has only 10 screws.

We were shooting for a final assembly time of 15 minutes. It actually takes only nine.

The 4105 was introduced at $3995; the other Unicorn models will be the 4107, which will have better display, more-powerful graphics and the ability to control more peripherals; and the 4109, a 19-inch-tube version.

Through use of the Tek 4170 graphics processing unit, these terminals become stand-alone graphics computers.

The Unicorn offers a warranty unmatched in the industry — a full year. On most terminals you're lucky to get three months.

The product line has already convinced one tough customer. We are buying and using them all over in our Tektronix divisions.

Automatic Tuneup for the CRT

The 4115B (there is no "A") provides the highest-quality color graphics available on the market. A special feature is a provision for autoconvergence, to insure that the high-resolution color image stays put.

In a color CRT, three guns (one for each primary hue) precisely fire electrons through a perforated mask to strike assigned color phosphors. If any gun is a bit off, it causes blurry or untrue color, and eye fatigue.

The 4115B has built-in circuitry that senses any gun misalignment and automatically corrects it. Just like having a car that gives itself a tune-up while you drive.

USING software from VR Information Systems, whom we acquired this year, an engineer works on gate-array software development. Tek's new 4115B terminal and 4691 color copier are pictured.

The 4115B rewrites its 19-inch screen at a 60Hz rate. Common in the industry is 30Hz; and that causes flicker. It can write 1024 x 1280 discrete points, and hold much more than that in its memory. (It's been said that such resolution could delineate a 3 cm. spot along the earth's equator.)

It has a graphic drawing speed of about 50,000 vectors per second, faster than any other terminal we know of. And it can display more colors at once than anyone knows what to do with — up to 256.

Like the Unicorn at the low end, the 4115B was also an "impossible" project that somehow got done: Producing a terminal that would be faster, sharper, brighter, better than anything on the market; working under tight deadlines. And it hit the market at a price far below what competitors had openly predicted.

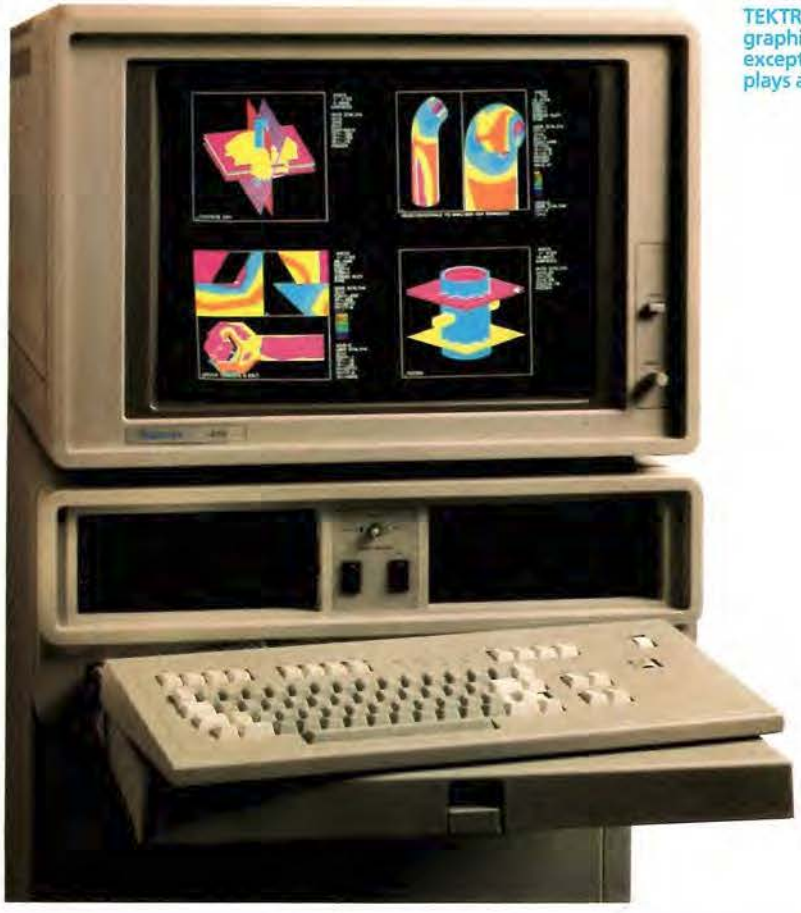
Tek is clearly out to regain its position as the leading graphics market-maker. You can feel the up tempo at Wilsonville.

"The Graphics Empire Strikes Back," reads a prevailing bumper sticker. That's the kind of thing we mean.

Applications Software on the Way

We're not out of the woods yet. Although we have the top utility software (enabling operation of our products), we have developed little applications software, to help users solve specific graphics problems. We're fixing that.

As a step in the right direction, we have acquired VR Information Systems of Austin, Texas, a small producer of software for design and development of printed circuit and IC software. It is at the leading edge in computer-aided-design applications for electrical engineering.



TEKTRONIX 4115B color graphics terminal offers exceptional flicker-free displays and great ease of use.

DAD: Fast Stepping in a Fast-Growing Market

Our Design Automation Division followed a tough act to follow (its 1982 performance) with another tough act to follow (its 1983 performance.) Sales in each business unit were strong, and products brought out this year once again look like winners.

Our product introduction has continued at a very rapid rate. That may have given rise to the rumor that divisional strategy is: Bludgeon the competition with new products. (That might look better in Latin.) More demurely stated, our goal is to keep ahead of customer needs.

The division has been growing faster than its markets; the markets faster than the electronics industry, and the industry faster (big deal) than the US economy.

We moved from a number 1 position to a stronger number 1 position in the explosive logic-analyzer market. We are first (maybe tied) in universal microprocessor-development systems also. Sophisticated design-automation tools like these are new ideas today; but by 1990 it's believed that most electronics engineers will have to use them. So it is an exciting market, and we are strengthening our presence.

A heartening plus: An old Tek product line, giant "S" series semiconductor test systems, this year has come into its own. We have about a year's backlog, thanks to being one of few companies whose products can test the new, very complex high-density "Superchip" ICs.

COLOR DAS (Digital Analysis System,) introduced a year ago, has been a best-selling Tek product, at the top of our logic analyzer line.

An Easy-to-Manage Workhorse

Logic analyzers, which picture and examine coded bits of data from many channels at once, have been called the oscilloscopes of the digital world. Someday they are bound to be just as common. So, many competitive analyzers exist.

Some of them offer high performance and versatility. Or so you might judge from the large numbers of buttons, knobs and switches all over the front of them. Some have 70 keys.

In our continuing goal of making instruments "friendly" rather than bewildering, we've developed a touch-sensitive CRT display. It has about 50 control commands available on the screen, activated by the touch of a finger.

This touch-pad is one of the more popular features of our medium-range workhorse analyzer, the 1240, new this year. When the finger breaks an infrared beam, operating instructions appear on the screen. Thus our keyboard remains simple, uncluttered.

Another ease-of-use feature is rapid, smooth scrolling through streams of displayed data.

Most analyzers "scroll" in this way: When the user pushes a button, the data moves forward in jerks and jumps. Ours has a large knob, like a radio-tuning knob, that enables not only butter-smooth rushing through masses of data but also easy fine-tuning to locate just the pieces you need to study. A simple-sounding idea, but it took a lot of technology to work it out. We call this advanced feature, incidentally, a Knob.

How do customers like the 1240? Well, its order rate exceeds those of our popular DAS 9100 and color DAS, at a comparable early stage of its life.

The 1240 performs general-purpose tasks, somewhat the way our portable oscilloscopes are used. The DAS is a more advanced tool, more like our laboratory scopes.

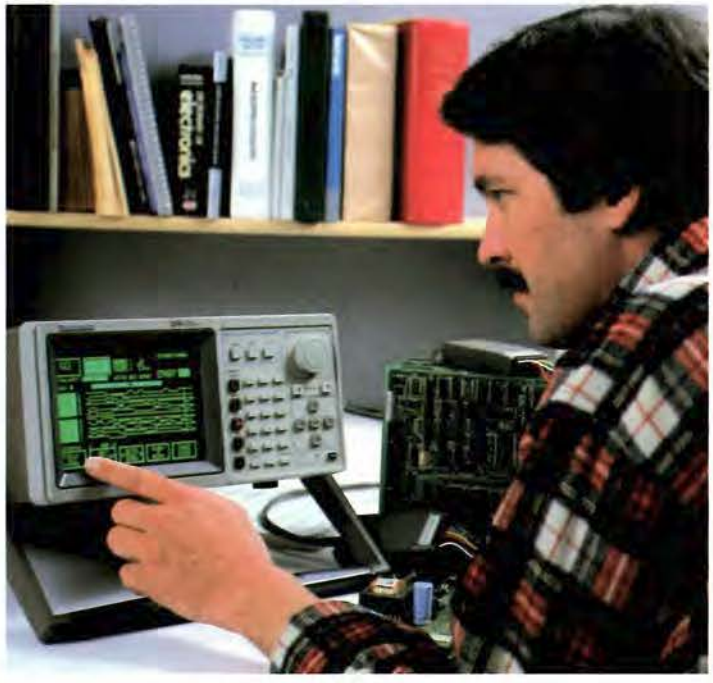
Other than for user-friendliness, the most important feature of the 1240 is its dual timebase acquisition — another first. This is likely to be as important as was the first dual-beam oscilloscope, an early Tek innovation. This feature lets the operator compare data from two separate sources; for example, two microprocessors that must interact in a complex system.

The 1240 continues the modularity we began in the DAS, by use of interchangeable plug-in cards to vary the number of channels of data acquired. (The 1240 can obtain up to 72 channels, using four cards.) And it extends that modularity through use of ROM (read-only memory) packs that enable analysis of acquired data, and COMM packs, which provide interface with computers.

Sales of DAS itself continued strong, as did those of color DAS, still the only well-received color logic analyzer. Competitors have tried color versions, too, but soon learned a sad truth: What customers want is not color, but color *without penalty*. Once you start trading-off sharp screen image or other operating advantages, color is not a very attractive feature.

To round out our line, we introduced two superportables, weighing about 11 pounds each: The SONY/Tektronix 318 and 338.

These "friendly" analyzers pack powerful performance into compact space. They are menu-driven, so the user doesn't have to plow line-by-line through a manual to find each next step. They have two major uses: For field service of computers and other digital equipment, and for general lab use when several users must share one analyzer in different locations.



TOUCH-PAD AREA on the CRT screen of our 1240 logic analyzer gives operating instructions at the touch of a finger. That keeps the keyboard from getting cluttered with buttons and switches.

SONY/Tektronix "superportables" round out our logic analyzer line, offering powerful performance in an 11-pound package.

These products vary in number of channels of data acquisition and speed of operation. The 318 is slanted more toward hardware applications, the 338 more toward software.

Like the 1240, they may be operated over phone lines. A less-skilled field technician can get instant help from experts thousands of miles away.

A Powerful New Software "Tool"

To most people, "software" is still an abstract idea. And if *that* is a vague concept, now consider the idea of software "tools."

A major DAD product this year is a set of "integrated software tools." One of the most complex software products we have developed, it goes by the name of LANDS, *Lan*guage *D*evelopment *S*ystem.

It's an industry first. It lets a software designer bring the entire design program under the control of PASCAL, one of the top high-level computer languages. Use of "high-level" (English-like rather than computer-like) language in software is roughly like use of push-button operation in complex machinery. The user devotes his or her attention to the problem at hand, and doesn't have to deal with (or even understand) the detailed workings of the tool.

LANDS (Language Development System) is one of our most important software products. It is used here on a new Tek 4105 color terminal. Our color interface, ColorKey + ™ is the only one offered by any microprocessor development system.

Ever more of an electronic product's costs go for software, detailed programs of instructions that make it do whatever it does. As microprocessor hardware gets more complex, software does too.

Strong efforts are being made to automate the software designer's job. But much of it, particularly in the conceptual stages, is still a pen-and-pencil task. Still another big part is time-gobbling detail work with low-level computer codes.

LANDS integrates four powerful programs: An editor; a compiler; an integration control system, and a PASCAL debug. Each greatly improves designer productivity.

- *The editor* enables the user to give broad PASCAL commands rather than to laboriously type digital code into a computer. Most editors don't speak PASCAL, so will pass on syntax errors uncorrected. The errors are caught later, when the program is run in the compiler. But then you have to run the whole shebang over.

LANDS' editor *does* understand PASCAL, so it catches each syntax error. It's a sort of PASCAL word-processor with a language corrector. The corrected program then moves to the compiler. (It's like catching proofreading mistakes in typed copy rather than halfway through the printing process.)

- *The compiler* is a pretty standard one, only optimized for microprocessor (μP) design.
- The largest time-saver is the *hardware/software integration control system* (ICS), for which we're seeking a patent. It can reduce months of tedious detail work to a half an hour. Literally.

Perhaps the most error-prone task in many μP designs is to fit the software to the prototype hardware. That normally requires extensive programming in assembly code.

First, our on-screen "menu" prompts the designer to be sure to cover all the main points. Then the ICS takes care of the details, including generating all the low-level code, oriented to whatever specific μP chip is being tested.

- *PASCAL debug* normally requires translation into assembly code. But LANDS solves the problem by elevating all debug software to the PASCAL level.

Our PASCAL debug takes advantage of the powerful real-time emulation provided by the Tek 8540 integration unit, which contains a μP identical to that in the hardware prototype.

Host-computer support for LANDS can be provided by the Tek 8560 software development unit or by the popular DEC VAX computer system.

APPLICATIONS ENGINEER debugs an IC test program, using a giant Tektronix S-3295 semiconductor test system. Ours is one of the few products able to test new high-component-density "Superchip" ICs.

Systems Orders Show a Healthy Trickle

"Onesy-twosy," our term for small orders, has no negative meaning at all at our Walker Road plant, where we build series "S" semiconductor test systems.

They sell, on the average, for about $1 million each. This year, accumulated onesy-twosy orders for our new S-3295 have become a very sizeable backlog. The operation had its best sales and most-profitable year.

The main cause is that the "Superchip" has arrived. Superchips are very large-scale integrated (VLSI) circuits, containing perhaps tens of thousands of electrical components on small semiconductor chips.

These high-population chips connect electrically with the outside world by pins, some of them channels for input, some for output, some both. Not long ago a 48-pin package seemed adequate. Now, a 200-pin package (with nearly 100,000 devices on the chip) is not uncommon.

Systems that can test such large-pin-count VLSI circuits are few. The S-3295 is one of them. It can handle up to 256 input or output channels.

Our system is an assemblage of integrated instruments, most of them Tek-made (including power supply, pattern generator and terminals.) It puts a VLSI chip through a programmed sequence of digital tests, and compares how the device behaves to how it *ought* to behave.

A swing in the market makeup has favored us. Buyers at first were largely commercial semiconductor producers, and devices were fairly simple. Now many companies (like Tek itself) have taken to making their own very complex VLSIs.

Design engineers like our system for its power, high resolution and size, and the range of voltages and currents in which it can operate.

Our system is especially good at device characterization — determining the exact limits of a device's performance: How far can you push it before it makes an error? The sort of thing you'd better know before you advertise the chip for sale, or use it in something that matters.

We're strongly positioned in the market. Given the impediments to introducing a million-dollar product, we don't expect a sudden burst of new competitors.

With pin counts going up, things are looking up.

Passing the Baton in Portables

It depends on just how you go about measuring it, but: The Tektronix 2465 portable oscilloscope may embody the greatest concentration of technology of any Tek product, ever. At least it's right up there. And it has done something as remarkable: Returned glamor, if you will, to oscilloscopes.

Let's face it: Scopes are old-hat. A new one is about as exciting as a new cocker spaniel. Take logic analyzers, microcomputers — they're *new*. But Tek scopes alone have been built for 36 years.

So the bedazzlement caused when we introduced our new 2000 "family" was gratifying. People who came in figuring "a scope is a scope" knew better when they left.

Top of the line is the 2465, a "flagship" product, giant in performance — by every possible measure the new standard for the scope industry.

Standing Behind the 2000s

It and three other additions to the 2000 family this year reaffirmed Tek as the performance leader in the important portables market segment. Just a year ago, we were fighting a holding action there. We were going up against shiny new competitive scopes, armed with our world-renowned but graying 400-series products.

How reliable are the 2000s? The entire family — nine models in all — bears what we believe is an unprecedented three-year warranty.

DOT-DASH cursor lines set the bounds for instant point-to-point waveform measurements on Tek's new top-of-the-line 2465 portable oscilloscope.

Further, they're designed to be built efficiently. Each entails less labor than the scope it replaces — a nice offset in these days of skinnying margins.

Last year's 2213 and 2215, the first scopes ever designed for high-volume production, saved labor hours by pioneering use of single circuit boards and large-scale automatic component insertion. They drew a tough assignment: To provide a price/performance barricade at the "low" end of the portables market, which was beckoning foreign and domestic competitors.

The products' light weight and reliable, full-featured performance drew solid reviews. They did their job, anchoring the low end for us. They became the fastest-selling Tek models in history.

Now the 2000 family has been rounded out. To the 60MHz 2213 and 2215 and the 100MHz 2335, 2336 and 2337 field-service portables, we've added the 100MHz 2235 and 2236, the 150MHz 2445 and the 300MHz 2465. The four were introduced all at one time. That gave the buyer a chance to make a truly educated choice. To us, the nicest kind of comparison shopping is for people to decide which Tek scope to buy.

The 2465 has the most dazzle, of course. But each model offers a superior price/performance ratio to that of its predecessor.

The New Standard: 2400

Superlatives all fit the 2400s. They abound in so much innovation that it's hard to know which "first" comes first.

It's the first portable oscilloscope to provide readout on the CRT screen of time, frequency, voltage, ratios, percentages, settings... Maybe its most important single feature is a pair of dot-dash cursor lines, which set the bounds for instant point-to-point measurements of waveform data. The feature saves time and tedious calculations. And it never makes a mistake.

The cursor feature may be as significant to oscilloscopy as was the marked-off CRT graticule itself (a Tek innovation, long ago). In fact, cursor plus on-screen readout of data nearly do away with the *need* for a graticule, other than for single-shot waveform photography, which precludes setting up cursors.

ICs Drive the Display

The 2400s are the first scopes in which the CRT is driven by integrated circuits.

They contain by far the most integration of any oscilloscope. Eleven Tek-made custom hybrid ICs handle all the analog circuitry. Integration allows enormous increase in compactness. Without it, it would have taken easily twice as much space to enable the 2400's performance.

Conventional CRTs require more power than an IC can generate. Our new 2400 tube is very sensitive, able to give a finer, brighter trace than standard CRTs, yet operates on lower power, such as an IC can provide.

The secret is our new meshless scan-expansion lens system.

In most tubes, the electron beam from the gun is expanded to fill the CRT screen by use of a fine domed mesh. The mesh doesn't look like much, but is the very dickens to build, costly, a major factor in both tube and scope rejects. It is allergic to everything from overheating to thumbprints — especially little bits of dirt. And every mesh problem translates directly to a glitch on the CRT — a halo, "blooming," a dark spot....

We got rid of the problem by getting rid of the mesh. In its place we put a meshless scan-expansion (MSE) lens, a nondescript yet precisely laser-cut metal device that expands the beam. Three sets of quadripolar lenses in the CRT gun (like those in a particle accelerator) "preprocess" the beam, flattening it on two axes into a configuration that lets the MSE lens do its job. Together they provide a supersensitive CRT.

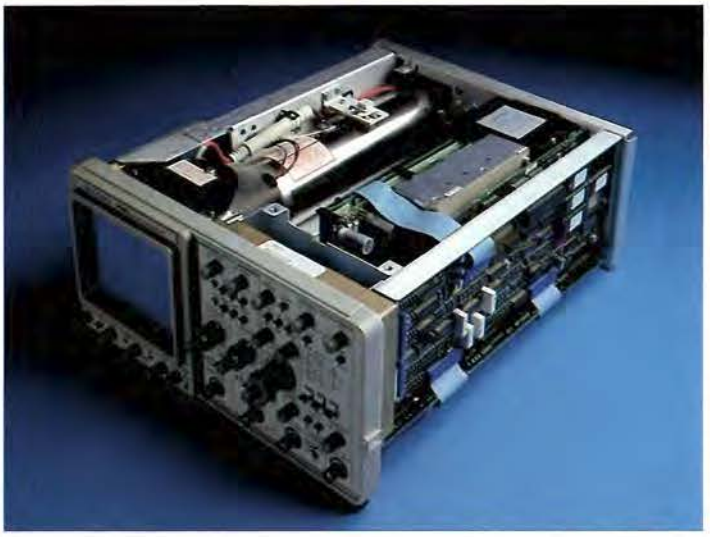
The tube is also an inch shorter than a conventional CRT, which knocks an inch off cabinet depth and a tad off the weight. And it is rugged — able to withstand a 150 G shock. Technical people will understand how much of a jolt that is. Other folks shouldn't give themselves one just to find out.

The 2400s also provide a new high in automatic triggering for portable scopes. Those of you who are old-timers will recall trying to adjust the earliest TV sets — first to get *any* picture, then to find the right one. You'll appreciate that fussing to get first a trigger, then the correct trigger, is one of the scope user's greatest irritants. Our "hands-off" autotrigger thus may be one of the greatest emollients.

Old Accuracy Marks Wiped Out — Really Wiped Out

The old Tektronix 465B, up to now the world's pace-setting portable, set the industry standards for vertical and horizontal accuracy. The 2400s have topped them — and by a large leap: *50 percent* better horizontal, *30 percent* better vertical.

These gains come about largely from using digital calibration. In effect, standard calibration instructions are imbedded as data in the IC memory itself.



SUPERLATIVE CRAFTSMANSHIP shows when the cabinet is removed from the 2465 portable oscilloscope. Below, close-up of Tek-made ICs in a 2465.

This new technique provides a high level of accuracy that otherwise would have to be approached by use of carefully matched components and a lot of adjusting. It also enables the scope to return to correct calibration at any time, since the instructions are built in.

Another factor in better accuracy is a front-panel control that adjusts for any timing mismatch between two probes.

Still another cause of better accuracy, and of improved high-speed scope performance, is active laser trimming, a manufacturing step. Each IC is run under actual conditions and its electrical performance fine-tuned. If capacitance or resistance is too high, a laser beam automatically trims away part of the circuit.

In our hybrid ICs, passive electrical components and circuit paths of conductive metal oxide have been silk-screened onto ceramic and fired at high temperatures. In the "trimming" process, the laser merely erases a bit of the width of an oxide path, bringing the circuit to near-perfect performance.

The alternative would be to test the completed IC later, when it's inside the scope, and adjust things at that point by laborious "tweaking" of the circuitry. It works. But it takes time. And it occurs awfully late in the manufacturing process. Also, tweaks can come *un*tweaked. Laser trimming cannot. It is done once and lasts.

The 2445 and 2465 vary in sweep speed and bandwidth. Each has four channels, two of them optimized for logic applications. These scopes fit well into advanced work such as semiconductor R & D, and high-speed digital design and troubleshooting, including of μPs and mainframes.

And the 2400s let Tek tradeshow booth people do one of their favorite things: "Take the top off the box" and let visitors *see* the craftsmanship inside. These products ooze quality. We've yet to see competition — even from companies (or countries) known for high quality — try that alongside ours.

Many Instruments in One

The lower-performance 2235 and 2236 are alike save for the latter's integrated digital voltmeter/counter/timer.

The scope/DVM/counter/timer provides a useful combination of useful instruments. It enables some measurements not otherwise possible, and makes some hard ones pushbutton-easy. Digital readout allows less-trained people to tackle the problem at hand without getting mired in math.

The 2236 (like the rest of the family) is user-friendly. Problems of various kinds in circuits being tested by the 2236 are noted by both audible and visible signals. A diode junction will result in a noise plus a display of the voltage drop. Leaky capacitors, bad transformers? The 2236 will catch your eye or ear or both.

It provides the same combination as does our 7603 lab scope with 7D13 and 7D14 plug-ins. We expect it will be just as popular.

It is useful in making timing and frequency measurements typical of the digital world. Operators of general-purpose electronics fix-it shops should also like it; each of its combined instruments is something such shops need.

All the 2200s are designed to give general-purpose solid service, with a particular eye to cost-sensitive buyers.

NEW 2465 portable scope undergoes extensive automated testing.

Viewers Are Quality-Conscious

It may be (or not) that the Typical TV Viewer *is* the undershirted brew guzzler that is so often depicted. In any case, don't sell him short. He is a very keen judge of picture quality, and intolerant when video signals do bad things.

To help inform and entertain that viewer without technical distractions is the job of Tektronix' TV Products business unit and our Grass Valley Group.

ENGINEER TROUBLE-SHOOTS a 300 series TV production switching system at The Grass Valley Group, Inc., our California subsidiary. Grass Valley products are world leaders.

GVG leads the world in high-quality transmission of television signals. Its new 3290 series of fiber-optic links carries almost distortion-free TV signals over optical fiber.

That is a really fast-growing market. A rapid switchover is going on, in phone-line and other transmission, from copper wire to glass fiber — in new buildings, for instance. Fiber is secure; you can't "bug" it. It is immune to electromechanical interference and radiation. It weighs less. It can be more economical. Best of all, it enables far wider-band transmission, such as digital signals require.

You wouldn't have known it, but if you watched space-shuttle landings on TV, you were seeing the 3290 in action, transmitting signals from NASA to NBC.

GRASS VALLEY GROUP Wavelink™ fiber optic communications system.

Besides leading in this fast-growing area, GVG is also the world's dominant supplier of TV routing and production switchers, and special-effects equipment. It had its best year ever this year.

It benefited from a shift in the industry's priorities: Increase purchases of special-effects equipment, which improves program quality, interests viewers and generates ad revenue (good news for GVG.) But defer purchases of tools (bad news for TV Products, which supplies largely test and measurement things.)

Even at that, Television Products had a pretty solid year.

Two product introductions were enthusiastically received by the broadcast industry:

A Clearer Picture of the Olympics

In an antique-clock shop, with 50 clocks going, what you do not hear are single TICK!s 50 times normal loudness. What you do hear is the cricket sound of 50 ticks, each a little bit off.

It's like that when TV signals from many sources are transmitted to a studio to be merged into a program. Each is a little off from the others. If those time differences aren't corrected, it raises hob with the program: Jerkiness, blacking out of the screen, rolling and other things occur that are viewer-obnoxious.

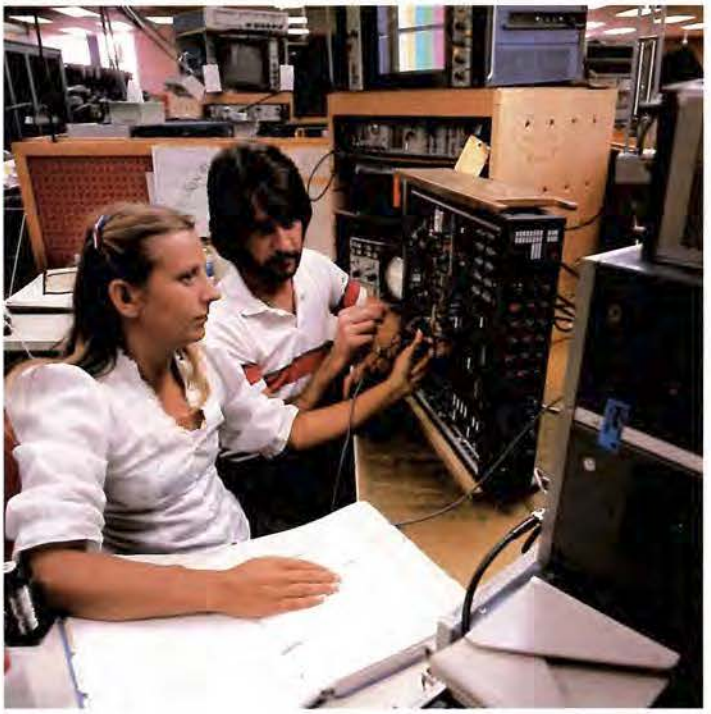
The 110S frame synchronizer is a different sort of product for our TV Products group, in that it does signal processing rather than test and measurement. Its state-of-the-art performance — built around the industry's only 10-bit A-to-D converter — outshines that of the existing leader: It enables the signal to pass through the synchronizer without leaving a distortion in the form of a grid or "footprint" on the picture. It is twice as accurate as competition, allowing an increase in brightness.

The 110S takes unrelated signals (say, from inside a studio, in a mobile van, off microwave) and coherently times them. It does so by digitizing the signals, synchronizing the digits and reconverting them to analog TV.

The studio needs to switch back and forth from one signal to another without distortions. You'll see the 110S's handiwork if you watch the 1984 Olympics. One network has placed a large lease-option order with us. Others are showing similar interest.

Studios like another feature of the 110S. Most synchronizers will simply cut off when signal quality gets too bad. It's just possible the studio engineers would like to have made that decision instead. Now they can; our synchronizer passes all signals, and the *studio* can decide how bad is "too bad to show."

CHART RECORDER for OF150 fiber optic cable tester is calibrated.



CALIBRATION OF 1910 digital test-signal generator. This new TV product is proving very popular in its early stages of introduction.

Our new 1910 digital (and analog) test-signal generator is showing a very strong early-order rate. One interesting indication of its value: We have sold it to Canadian customers — against its top competition, a company from Canada — even at a substantial price premium.

Our introduction was well timed. A large number of US broadcasters have been upgrading their ability to transmit Teletext, a video magazine. Several features of the 1910 make it ideal for adding Teletext, which is shown on normally unused parts of the TV picture.

Elsewhere in the Communications Division, the spectrum analyzer business continued its low-key but steady strengthening of Tek's already solid number 2 position. Our high-performance portable 492's are very popular for military uses, and are the choice of the US Air Force and both US and British Navies.

We introduced the SONY/Tektronix 380, a very portable combination instrument: Waveform monitor, oscilloscope and vectorscope — a battery-operated all-purpose tool for the TV industry.

Our OF150 fiber-optic cable tester has become the standard for much of the telephone industry. The instrument sends light down a glass fiber, measures its reflected scatter and determines loss of signal fidelity due to cable splices.

The OF150 exceeded our sales estimates everywhere except Japan. It must be modified to meet that country's standards.

A CAN-DO BASE OF TECHNOLOGIES FOR TEK — AND THE WORLD

They're asking too much of high technology — "they" being the politicians, the sociologists, the just plain folks. There's no way that "high tech" can hire everyone else's extra workers. It is not guaranteed to prevent (or win) World War III. It has a very slight chance of creating Utopia. It may not even cure the common cold.

The well-publicized belief that it will do some or all of these things is caused by the many impressive things it has shown it *can* do.

TEK-DEVELOPED high-frequency probe for ICs on wafers (above) enables measurements up to 18GHz, making it the fastest wafer probe in existence. (Close-up at left.)

TRAINING AND tools for IC designers are provided for each of our divisions by our R & D staff.

Our Technology Group provides a broad base and deep well of R&D "can do." It is increasingly evident in our new products.

To spread its use within Tektronix, our research people are moving out into our divisions with tools and training to help engineers there learn advanced methods.

We are also looking into ways to export technology to the world at large, other than inside Tektronix products.

You can quickly get broke and ragged if you shag every interesting investigative idea. To be able to pursue more of the promising ones, we will form a Tek organization whose charter will enable us to take part in joint-venture and spinoff companies.

Another way to benefit both outsiders and ourselves from our knowhow is through formation of Strategic Program Units. They are much like Tek business units, but even more like small businesses of their own, free of some of our operating restraints. Each will have a different charter. It may be to look into a technology that Tek alone will use. Or it may be to develop devices with broad commercial potential, then explore the uses the world may have for them.

If the venture succeeds, an SPU may become a Tek business unit, or part of one. Or it may turn into a spinoff company, on its own or partly owned by Tek.

If the effort does not pan out, the participants will rejoin our normal organization. They will have learned new things. Not the least of them will be general-manager skills, of which we are short at the moment.

We'll describe for you in these pages five distinct aspects of Tektronix technology — a "can-do" sampler:

A dramatic way to shortcut the design of integrated circuits; a shutter that can help a black-and-white TV tube produce a multi-color image; a television tube so bright you could sit in the sun and watch it; a process that can quintuple the speed of ICs; and a joint venture with ex-employees to produce a display device that does what a CRT does but is less than an inch thick.

Monochrome Blossoms in Color

What you see on the CRT screen is a display in vivid colors. The image is knife-sharp. The contrast is very high, almost unaffected by the room light.

Interestingly, the display is not on a color tube at all, but on a standard monochrome CRT.

Bringing color out of no-color may seem like alchemy, but it isn't. It's not even new; rainbows do it routinely. Now, so can Tek.

Our new liquid-crystal color shutter display system, announced this spring, is built on five bits of knowledge:

1. What we see as white light is really a mixture of all the colors.
2. Filters can transmit some colors, block others.
3. Light waves can be polarized—that is, lined up in an orderly fashion along any axis you have in mind.
4. Liquid crystals can bend, or rotate, polarized light.
5. The human eye is quite slow at reacting to light going on and off.

Our color shutter, combining CRT and liquid-crystal technology, is now available for commercial use. That will include *our* use; the color shutter offers the first practical means of obtaining color displays on small instruments. Interest in the scientific and technical community has been strong. We're now "trolling" to see what a range of uses the rest of the world may have for this unique color system.

How it Works, and Why

The shutter package is a sandwich within a sandwich. The inner one comprises a center of liquid-crystal molecules contained by two clear layers of glass. That sandwich is itself packed between a neutral polarizing filter behind and two color polarizing filters (one red, one green) in front.

The whole assembly fits neatly onto the front of a CRT so the screen light shines through it. The CRT we chose has a phosphor that appears yellow (actually a mix of red and green) and is very bright.

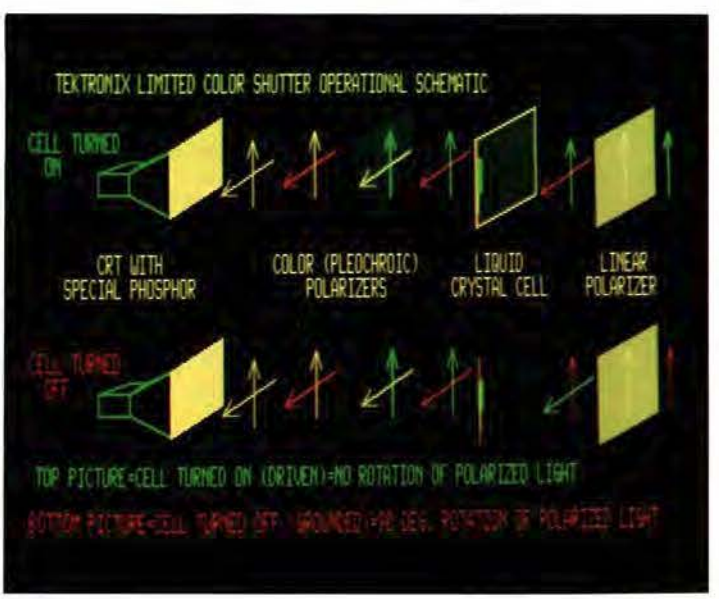
That brightness is needed, since the CRT gun must divide its time, share the light. It will write each screenful of information twice, once for things that will be or contain red, the other time for green.

As the yellow light from the phosphor shines through it, the first polarizing filter transmits half the red portion and aligns it vertically. (It may help to think of it as an up-and-down venetian blind—but only up to a point; to the rest of the incoming light, it is transparent, like a window.)

The next filter performs the same operation on the green portion of the light, only aligning it *horizontally.*

The pair of "venetian-blind" filters now has sorted out the yellow light into two manageable color components, vertically polarized red and horizontally polarized green.

LIQUID-CRYSTAL color shutter enables high-resolution vivid-color displays from a monochrome CRT. Shutter explanation in the bottom photo was taken from an LC color-shutter display. The printed picture cannot capture the full brightness and contrast of the actual display.



Next the light passes through the liquid-crystal shutter, to a third polarizer, a neutral one called an analyzer. It is oriented vertically, and will transmit to the viewer whichever color can be aligned that way.

The job of the shutter is to optically "rotate" the two filtered colors so each can pass through the analyzer. It will do this very fast; the viewer's eye, too slow to catch on to what's happening, mixes the red/green components and recreates the color being written on the screen. That color can range from full red through yellow to full green, depending on relative beam current used.

Our shutter cell contains many longish liquid-crystal molecules. They tend to lie parallel to the two glass "alignment" layers. When an AC voltage is applied, the molecules rotate 90 degrees — toward the incoming light. When the voltage is turned off, the molecules relax toward their normal alignment. This switching enables first the red then the green polarized light to match the analyzer's, and be transmitted. While the shutter is in one position, the CRT writes the green (or green-containing) information on the screen; in the other shutter position, it writes the red portions.

Liquid-crystal shutters were formerly too slow for this kind of job. Those in digital wristwatches switch only five to 10 times a second. Even fancier ones have been limited in speed because the inner molecules take so long to settle down after the switch is turned to "off."

Tek solved this problem, partly by meticulously fixing the aligning molecules' angle. That has provided a molecular array free of "bounce" and a cleaner, much faster switch — one to three milliseconds.

Many Doors (Windows?) Opened

Liquid-crystal color-shutter displays can offer many advantages. A big one is that they are barely affected by room light and glare. First, the ambient light, to get to the CRT screen, must pass through the filter sandwich, which removes most of it; then, as what's left of it reflects back off the screen, it passes through and is reduced by the filter packet once more.

Another inherent advantage is a sharp, high-resolution image. In color tubes three beams (red, green, blue) must precisely overlap. There is always some misalignment, causing incorrect color, or fuzziness, or both. The LC image requires only one beam, and can be as sharp as the gun quality allows.

Liquid-crystal color also can offer cost advantages.

This shutter is equally able to work with raster (TV-type) or refreshed vector (oscilloscope-type) tubes. There has been no practical way to do the latter up to now.

Some likely uses may be computer work stations, where color tubes often have not offered high enough resolution; word-processing displays, where color has been either impractical or too costly; and small displays for process control, such as those on vacuum systems, which now may include color to highlight warnings or other special messages.

The shutter is a first for Tek, in that we are marketing a technology to see what uses the technical community can put it to. For us, the first applications will be in small instruments, such as oscilloscopes and spectrum analyzers.

A New Approach to Displays

Tektronix and a group of former employees have jointly invested in a company that will develop and build electroluminescent (EL) flat-panel displays.

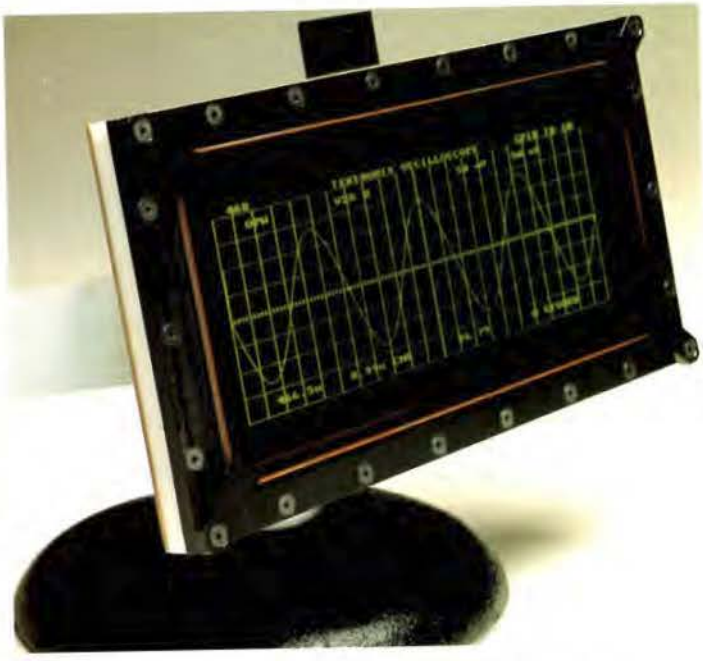
Tektronix has taken a minority position as a preferred shareholder in Planar Systems, Inc., in exchange for rights to Tek-developed EL technology.

Using that technology, Planar will build flat-panel displays intended for military and commercial information terminals and personal computing products.

Flat panels, as cathode-ray tubes do, produce an image on a sensitive phosphor screen. Unlike CRTs, these panels are solid-state. They're also shallow, only ¾ inch thick, and that includes all the electronics. They will be useful in products where flatness, compactness or portability is important.

The flat panels are matrix-addressed; the visible image occurs when an AC voltage is applied across a tightly-spaced grid. It strikes a selected pattern of X-Y coordinates, exciting the electrons imbedded in the phosphor and causing them to light up.

James M. Hurd, Planar president, was manager of our Solid State Research Lab. He will continue as consultant to Tek on other research projects.



FLAT-PANEL displays of waveform, alphanumeric and graphic information are a Tektronix technology that will be put to broader use. Planar Systems, Inc., a group of former Tek employees, will manufacture the product. Tek is a shareholder.

Executive Vice-President Bill Walker says the joint investment is a unique approach in pursuing new technology. We have no present plans to use flat panels in our products, so we have chosen not to manufacture them.

But the technology has excellent market potential. This way we can participate in that potential without financing the manufacture.

And, if the displays do fit into future Tektronix products, we have a potential US supplier.

Jim expects to be able to produce the panel displays sometime between spring and fall of 1984. The company is setting up a manufacturing plant near Portland. In the meantime, Planar will use the prototype facility at Tek where the product was developed.

You Can Lead an Engineer to Silicon

To nudge more Tek design engineers to move from etched circuits to silicon ICs, our research organization is offering our divisions both design tools and training. The tools include IC design guidebooks, computer-aided design programs, "quick chips," gate arrays and cell libraries.

Normally it takes 12 to 18 months to design and produce a custom IC. Quick chips, gate arrays and cell libraries cut the design and manufacturing down to three or four months.

These short-cut design tools vary from simple to very complex.

The simplest is the quick chip, a group of proven parts on a piece of silicon. Everything is completed except for the final step that interconnects whichever parts the designer wants to use. A quick chip is a fast turnaround tool for a simple design, 50 parts or fewer. As with an erector set, there are generally unused parts.

A gate array on silicon (or, soon, gallium arsenide) is a similar but more complex design tool. It is a chip with an orderly arrangement of up to 500 logic gates — transistors grouped as on-off switches. The multilayered array is complete except for the metallization layer that will provide the circuitry connections among the gates. The designer adds that last layer to give the chip its unique performance. Like the quick chip, the gate array usually has unused elements.

The cell library, however, has no leftover parts. Our most sophisticated fast-design approach, the "library" (stored as software in a computer memory) contains "cells"—groups of gates — already connected to form different kinds of logic functions. On a chip, these cells are linked into complex customized groupings. Because this approach has no leftover elements and uses chip space efficiently, cell libraries can be used for intricate, high-density circuitry, several thousand parts on a chip.

We're using all these devices in our products to let us respond faster to the market. That's important in these competitive times.

Gallium Arsenide: A Faster Track for Electrons

Pushing the state of the art in many Tek products means producing ever-faster devices. In our search for speed, we have developed a leading national position in gallium arsenide (GaAs) research and development.

The potential of this compound (a crystal material like the element silicon, only a semi-insulator rather than a semiconductor) has been long known. It took recent emergence of reliable base-material supply to make GaAs devices a reality.

Gallium arsenide circuits are fabricated like silicon ICs. The only difference is the base material. But, when it comes to high device speed, what a difference!

Since electrons move through gallium arsenide more freely, we can produce GaAs ICs that are much faster than those of silicon.

There are trade-offs; so this material won't replace silicon. But for high-frequency ICs such as many Tek instruments demand, GaAs provides the performance we need.

Tek will use them to advantage — not just in on-off circuits but also in fast analog-to-digital converters.

But, beyond that, we see a wider opportunity to benefit from our leadership in this technology. We will form a Strategic Program Unit to pursue the idea of outside sales of custom devices. That will serve two purposes: (1) Help us fund the production program, and (2) by enabling broad innovative use of gallium arsenide, keep us in the forefront.

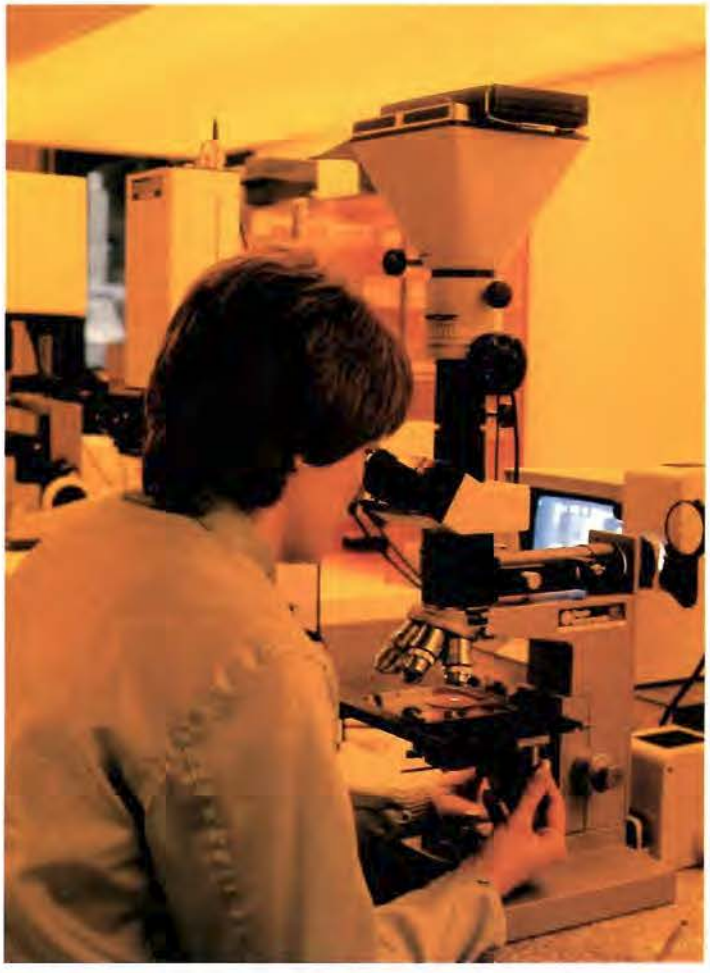


PHOTO-LITHOGRAPHY for gallium-arsenide IC fabrication attains standards that put us at the forefront of this advanced technology.

A CRT for Daylight Use

You'd have trouble watching color TV in the full daylight. The sunshine would wash out much of the picture. But the new Tektronix T-8100 CRT is so bright you *could* view the image even in the direct sun.

That's why it was built — to be used in the daylight, in open cockpits with the sky coming in.

The tube was developed under contract to Sperry Flight Systems, Phoenix, for aviation applications. However, we will begin to manufacture the tubes for sales to other customers beginning in March.

The tube has 10 times the brightness of and greater resolution than conventional color CRTs. It works in both vector (point-to-point lines) and raster (television-type) displays.

Information required to fly modern aircraft has increased in volume and become much more complex. Older methods of indication and display (gauges, altimeters, servo-mechanisms) have grown less and less useful. For one thing, they crowd the control panel; another, they show information separately that ideally should be correlated: Rate of climb, attitude, altitude, ground and air speed, direction, fuel efficiency, air maps . . . Video displays, on the other hand, present many layers of information at once, clearly delineated by colors.

THE BRIGHT daylight would wash out most color displays, but the Tek T8100 CRT produces a highly visible image. It will be used at first in avionics.

It was Boeing Company, in its new 757 and 767 jets, that showed the value of on-board color displays of flight information; two people instead of three can handle the cockpit. But the CRT screens had to be sheltered from sunlight so as not to lose the important color distinctions between information.

Shielding is easy enough in a commercial plane. But military users don't have that option, often having to view the displays in open cockpits. So a far brighter tube was needed.

In a conventional CRT, beam current from the three color guns passes through triads of holes in a domed "shadow" mask that fits right behind the phosphor screen. Increasing the current increases the brightness; but that overheats the mask. It sags; the holes move out of position, which distorts the mask-phosphor registration. The result is lack of color purity.

The T-8100 has a flat-faced tube —and the domed shadow mask is replaced by a flat one also, that is pulled taut by mechanical stressing on all sides. Beam current now causes localized heating, which merely relieves some of the stress. But the holes stay put, the beam strikes the phosphors properly and the colors are precisely correct.

Besides the brightness the taut-flat mask allows, our use of closely spaced triads in the mask enables exceptional visual resolution. Even when squinted at from close up, diagonal lines *appear* as diagonal lines, not the stair-step of dots typical of other CRT displays.

The tube has a 5x5-inch viewable area. We've been contracted to build a 6x6-inch model also, which we will market in spring. We're also prepared to develop other display devices for avionics.

The World's Best Circuit Boards

The best etched-circuit-board manufacturing plant there is, is Tektronix' new facility at Forest Grove, Oregon, which started up in January. It stacks up well against known industry standards.

It's probably the most computerized such operation in existence. That plus automated material handling and state-of-the-art process systems give us a great advantage in technology, quality, cost and time-to-market.

Circuit boards are building blocks of almost all Tektronix products. They not only are the base for inserted components but also provide the perhaps thousands of feet of electrical interconnections within the instrument.

Onto the copper-clad epoxy-glass board, photographically produced electrical paths are printed; the unwanted copper portions are etched away. This process in Tek instruments involves very advanced technology. Our ECBs range from simpler single boards up to densely packed, very intricate 10-layer laminated "sandwiches." They demand increasingly fine-line electrical paths to accommodate today's microcomponents, and tomorrow's.

Our new 174,000-square-foot plant is set up to produce the world's highest-quality, highest-technology boards, at the lowest cost.

The plant contains, almost entirely, new state-of-the-art process equipment from the finest suppliers in the world.

Automated equipment spells productivity increase. Our Beaverton ECB operation, with 700 people, produced 500,000 square feet of circuit board per year. The new plant is run by 400 people — and eventually will turn out 1,600,000 square feet per year.

In general, the move has meant upgrading jobs to a higher technical level. Gone are the grunt-level tasks, like hand loading and unloading of process lines.

NOBODY IN THE picture at Forest Grove? That's the way it often is at our highly automated circuit-board plant. Here, an unmanned delivery cart responds to a computer command, guided by an electrical circuit in the floor. Below, circuit boards move along untouched by human hands.

Other things are done differently at Forest Grove also. Suppliers may now feel they have somehow become *part* of our company.

Tektronix owns no materials, maintains no inventory and has only minimal in-house storage. Material belongs to the supplier, who does the warehousing nearby. We have it on consignment, and pay for it as it is used.

Each supplier has an "exclusive"; that is, it is our sole vendor for that material so long as our standards are met: To be the world's best. Suppliers are chosen on no single basis, but a varying mixture of cost, reliability, quality, R & D capability and willingness to provide service.

The "all or nothing" approach has encouraged high quality and prompt delivery and service. And suppliers like it. Knowing our weekly or daily requirements ahead of time enables good planning and inventory management.

Production of the state-of-the-art circuit boards began at Forest Grove in January. Because of lowered demand for that component, plans to shut down the Beaverton ECB plant were telescoped. We'd planned to end production there in six months; we shut it down instead in six weeks.

With the lead-footed US economic recovery, we have excess capacity. But, luckily, high-quality circuit boards are a very marketable item. So, just for a time, we will sell our excess production to national manufacturers of computers and related equipment.

DR. F. PAUL CARLSON

DR. DONALD O. PEDERSON

Board Adds Two Members

Tektronix' board of directors added two members in June 1983:

■ Dr. F. Paul Carlson, 46, is president and chief executive officer of Oregon Graduate Center, a postgraduate education and research institution near Portland. Dr. Carlson is a director of Pacific Power & Light Company, Servo-Motor Technology Corporation and Emanuel Hospital, Portland; and a trustee of Pacific Lutheran Theological Seminary, Berkeley.

■ Dr. Donald O. Pederson, 58, is a professor of electrical engineering at the University of California, Berkeley, where he has served on the faculty since 1955. He is recognized as a world leader in computer-aided design technology. Dr. Pederson was a Guggenheim Fellow, received the 1969 IEEE Education medal, and was elected to the National Academy of Sciences in 1982.

Four Vice-Presidents Chosen

Four vice-presidents were appointed by Tektronix board of directors during the year.

■ Peter Strong, 42, has had 20 years experience with Tektronix. He began as maintenance manager for Tektronix Australia Pty. Ltd. in 1963, then was field engineer for that subsidiary. After two years on loan to the Tek distributor for Southeast Asia, he returned as staff engineer at Beaverton, then progressed through a variety of responsibilities for Tektronix and Tek Australia. Among them were forming a group to exploit the possibilities of microprocessor development aids as a Tek product; and serving as general manager for our New Ventures group.

He became general manager of our Data Communication Analyzers and Logic Analyzers business units in 1979, serving in that capacity until September of the past year. Then he became general manager of our Design Automation Division.

■ Stan Kouba, 52, is Corporate Service and US Field Support manager, responsible for our acclaimed service program. He has held that responsibility since 1982.

Before that, Stan held a variety of service-related jobs with Tektronix. He joined us in 1960 as technician at our Washington, D.C. service center, was service center supervisor, then sales engineer at our Chicago center, and sales engineer at Houston. Then he came to Beaverton and progressed through a range of increasing responsibility in service-management jobs.

■ Fred Hanson, 44, manager of our Portable Oscilloscopes business unit since March, 1983, came to us from Hewlett-Packard Company, where he had 20 years of diverse experience in management of both technical and manufacturing groups.

Most recently, he was general manager of H-P's Corvallis, Oregon, Personal Computation Group, which designs and produces calculators. He was R & D manager there from March, 1978 until April, 1981. Other responsibilities with H-P included manufacturing management jobs at Corvallis and at Loveland, Colorado.

■ Dave Friedley, 44, has been a Tektronix employee since March, 1974, when he joined us as marketing manager for Frequency Domain Instruments.

Before that time he had worked nine years with Genrad Inc. in marketing, sales and management positions, including managing its High Frequency Equipment group from January, 1971 to 1974.

At Tek, he has been Frequency Domain Engineering manager and the executive vice president of The Grass Valley Group, Inc., our California subsidiary.

PETER STRONG

STAN KOUBA

FRED HANSON

DAVE FRIEDLEY

Tektronix Worldwide

Tektronix, Inc.

CORPORATE OFFICE:
Beaverton, Oregon

UNITED STATES MANUFACTURING:
Beaverton, Oregon
Forest Grove, Oregon
Portland, Oregon
Redmond, Oregon
Vancouver, Washington
Wilsonville, Oregon

UNITED STATES SALES AND SERVICE:

Albany, NY
Albuquerque, NM
Atlanta, GA
Baltimore, MD
Boston, MA
Chicago, IL
Cleveland, OH
Concord, CA
Dallas, TX
Dayton, OH
Denver, CO
Detroit, MI
Fort Lauderdale, FL
Houston, TX
Huntsville, AL
Indianapolis, IN
Irvine, CA
Kansas City, KS
Knoxville, TN
Long Island, NY
Los Angeles, CA
Milford, CT
New Orleans, LA
Newport News, VA
Oklahoma City, OK
Orlando, FL
Pensacola, FL
Philadelphia, PA
Phoenix, AZ
Pittsburgh, PA
Portland, OR
Poughkeepsie, NY
Raleigh, NC
Rochester, NY
St. Louis, MO
St. Paul, MN
Salt Lake City, UT
San Antonio, TX
San Diego, CA
Santa Clara, CA
Seattle, WA
Syracuse, NY
Washington, DC
Woodbridge, NJ

AMERICAS-PACIFIC OPERATIONS:
Tektronix, Inc.
Beaverton, Oregon

EUROPEAN OPERATIONS:
Tektronix Europe B.V.
Amstelveen, The Netherlands
Tektronix Limited
Guernsey, Channel Islands

INTERNATIONAL MANUFACTURING:
*SONY/Tektronix Corporation
Tokyo and Gotemba, Japan
Tektronix Guernsey Limited
Guernsey, Channel Islands
Tektronix Holland N.V.
Heerenveen, The Netherlands
Tektronix U.K. Limited
Hoddesdon, United Kingdom
Tektronix, Inc. Purchasing Office
Tokyo, Japan

INTERNATIONAL SALES AND SERVICE:
Australia — Tektronix Australia Pty. Limited, Sydney, Adelaide, Brisbane, Canberra, Melbourne and Perth
Austria — Tektronix Ges.mbH, Vienna
Belgium — Tektronix S.A., Brussels
Brazil — Tektronix Industria e Comercio Ltda., Sao Paulo and Rio de Janeiro
Canada — Tektronix Canada Inc., Barrie, Calgary, Edmonton, Halifax, Montreal, Ottawa, Toronto, Vancouver and Winnipeg
Denmark — Tektronix A/S, Copenhagen
Finland — Tektronix Oy, Helsinki
France — Tektronix, Paris, Aix-Les-Milles, Lyon, Nanterre, Rennes, Strasbourg and Toulouse
Germany — Tektronix GmbH, Cologne, Berlin, Hamburg, Karlsruhe, Munich, Nuremberg
Ireland — Tektronix U.K. Limited, Dublin
Italy — Tektronix S.p.A., Milan, Rome and Turin
Japan — *SONY/Tektronix Corporation, Tokyo, Fukuoka, Nagoya, Osaka, Sendai and Tsuchiura
Mexico — *Tektronix S.A. de C.V., Mexico City
The Netherlands — Tektronix Holland N.V., Badhoevedorp
Norway — Tektronix Norge A/S, Oslo
Spain — Tektronix Espanola S.A., Madrid and Barcelona
Sweden — Tektronix A.B., Stockholm and Gothenburg
Switzerland — Tektronix International A.G., Zug and Geneva
United Kingdom — Tektronix U.K. Limited, London, Harpenden, Livingston, Maidenhead and Manchester

*Joint Venture Companies

The Grass Valley Group, Inc.

MANUFACTURING:
Grass Valley, California

EUROPEAN OPERATIONS:
G.V.G. International Ltd.
Winchester, United Kingdom

UNITED STATES SALES AND SERVICE:

Arden Hills, MN
Atlanta, GA
Edison, NJ
Elkhart, IN
Fort Worth, TX
Palo Alto, CA
Woodland Hills, CA

V-R Information Systems, Inc.
Austin, Texas

Tektronix Management Review

Tektronix experienced a decline in the demand for its products during the past fiscal year. Increased competition in certain product lines and a depressed world economy contributed to this decline in order volume. Weakness in foreign currency exchange rates against the dollar also contributed to the downturn in the Company's business in foreign markets, which were, on the whole, somewhat weaker than the domestic market.

Since its founding in 1946, the Company has played a significant role as a supplier of products contributing to the advancement of science and technology. Management views the principal focus for the future of the Company as that of a broad-based supplier of products in this field, and believes Tektronix' future strength depends to a large extent on the successful development and introduction of innovative new products.

Inflation has had a significant effect on the Company's materials and labor costs as well as on the total amount invested in recent years in new plant and equipment. These factors, which were evident to a lesser extent in the most recent year under review, combined with an unfavorable economy and increased competition to limit the Company's ability to counteract higher costs and expenses with price increases. As a result, margins have decreased over the period covered by this review. The accounting view of inflation is set forth in the Notes to Financial Statements.

The comparison of 1983 financial results to those of prior years is affected by the adoption by the Company this year of Financial Accounting Standard No. 52 to account for the effects of foreign currencies. The financial information for prior years has not been restated to reflect this method.

Financial Condition — Management believes that Tektronix' financial condition positions the Company well for the future, with substantial internal cash flows as well as the capability to seek additional funds from outside sources.

1979	1980	1981	1982	1983	(in thousands)
$275,652	$347,086	$359,264	$ 388,714	$ 442,252	Working capital
642,907	841,693	953,753	1,042,287	1,087,414	Total assets
28,997	45,809	50,175	66,334	33,675	Short-term debt
62,094	136,196	146,143	132,060	152,342	Long-term debt
402,800	483,338	557,544	630,449	661,695	Shareowners' equity

Tektronix' working capital has varied between thirty-three percent and thirty-seven percent of net sales for the past three years. A substantial portion of current assets is represented by short-term investments overseas. The accounts receivables total, as a percentage of net sales, was 19.3 percent in 1981, 19.3 percent in 1982 and 17.7 percent in 1983; inventories were 27.7 percent of net sales in 1981, 24.3 percent in 1982 and 24.6 percent in 1983. Current liabilities remained at a constant level (approximately 20 percent) relative to sales for 1981 and 1982, but declined to 16.6 percent in 1983.

Total assets have increased as a result of substantial capital investments in technically advanced buildings and equipment. Expenditures in these categories in 1981 were $114.1 million; in 1982 and 1983, the amounts were $102.4 million and $93.3 million, respectively. Management expects that capital spending will continue at comparable levels in 1984 and 1985. The costs to complete facilities projects authorized at year-end 1983 is estimated to be $58 million.

The Company's expanding asset base has been financed largely by funds generated from operations; $121.9 million in 1981, $144.7 million in 1982, and $141.9 million in 1983. These internal funds have been supplemented with external borrowings and the sale of shares to employees. Management anticipates that funding needed to fulfill the Company's capital commitments will be provided from these same sources and from other sources as appropriate. The Company currently maintains $115 million in long-term bank lending commitments and had $81 million of unused short-term credit lines at fiscal year-end.

Short-term borrowings and maturing long-term debt increased $4.4 million in 1981 and $16.2 million in 1982, but decreased by $32.7 million in 1983, when the Company's $35 million principal amount of eight-year notes matured. Long-term debt was up $9.9 million in 1981, down $14.1 million in 1982, and then increased in 1983 by $20.3 million. The ratio of total debt to invested capital has declined from 26.0 percent in 1981 to 21.9 percent in 1983.

Shareowners' equity was reduced by a $12.4 million charge during 1983 resulting from the Company's adoption of Financial Accounting Standard No. 52.

Results of Operations — Fiscal year 1983 was characterized by a slight decline in sales — the Company's first such decline since 1971 — and substantial declines in operating income and earnings from the prior year. Management attributes the sales decline to the decline in customer orders for the year. Customer orders declined more sharply than sales in 1983, falling 8 percent, while net sales declined less than 1 percent. Order volume for the year represented a sharp change in trend from 1982, when order volume increased 17.4 percent over 1981. Management attributes this change to the economic environment, reduced orders from OEM customers (primarily OEM customers of the Information Display Division), competition, the effects of weakness in foreign currency rates against the dollar, and the timing of new product introductions by the Company. These factors were offset in part by an increase in demand for Design Automation Division products.

Manufacturing cost of sales continued to increase as a percentage of net sales. Cost of sales was 48.3 percent of sales in 1981, 49.8 percent in 1982, and 51.7 percent in 1983. Under-utilized manufacturing facilities, owing to the lower than anticipated demand, and increased indirect labor costs contributed to the manufacturing cost increases. Increased inventory obsolescence expense also

contributed to higher manufacturing costs in 1983. This increase resulted in approximately $15.3 million of additional cost of sales compared with the prior year.

1979	1980	1981	1982	1983	(in thousands, except per share amounts)
$786,936	$971,306	$1,061,834	$1,195,748	$1,191,380	Net sales
121,448	147,849	138,036	146,447	114,455	Operating income
77,151	85,072	80,167	79,453	48,714	Earnings
4.28	4.66	4.34	4.25	2.57	Earnings per share
.60	.79	.90	.98	1.00	Dividends per share

The Company has continued its program of investment in facilities and improved manufacturing systems. As a result, depreciation expense, based on accelerated methods, has grown from 2.7 percent of sales in 1979 to 5.6 percent in 1983. This added charge affects both cost of sales and operating expenses.

Operating expenses have remained relatively constant as a percentage of sales for the last three years, ranging from 38.0 percent to 38.7 percent. Selling and engineering expenses have increased as a percentage of net sales each year since 1981. Engineering consumed 10.5 percent of net sales in 1983, compared with 9.1 percent in 1982 and 8.6 percent in 1981. Selling expenses went from 14.8 percent of net sales in 1981 to 15.1 percent in 1982 and 15.6 percent in 1983. Administrative expenses were 9.5 percent of net sales in 1981, 9.1 percent in 1982 and 10.1 percent in 1983. These operating expense increases in 1983 were due primarily to lower than anticipated sales levels and the impacts of divisionalization. Profit sharing expense, which varies generally with income levels, has declined for more than three consecutive years. It represented only 2.5 percent of net sales in 1983, compared with 4.6 percent in 1982 and 5.8 percent in 1981.

Interest expense decreased by 12.5 percent in 1983 because of lower rates and reduced borrowings. Non-operating losses in 1983 of $25.5 million represent a substantial negative change from non-operating income of $9.5 million in 1982 and $19.6 million in 1981. The primary factor influencing non-operating income and expense in 1983 was a $30.5 million charge against earnings representing the actuarial cost of the Company's early retirement opportunity program, recognized in the third fiscal quarter of the year when the program was adopted.

Income tax expense decreased substantially in 1983, primarily as a result of reduced taxable income.

Earnings declined by 38.7 percent in 1983, following a decline of one percent in 1982. This decline reflects primarily the charge against non-operating income discussed above; the increased cost of sales and operating expenses; and to a small extent the decline in business volume. These factors were offset in part by the decline in income tax and profit sharing expense for the year.

AUDITORS' OPINION

To the Shareowners of Tektronix, Inc.:

We have examined the statements of consolidated financial position of Tektronix, Inc. and subsidiaries as of May 28, 1983, May 29, 1982, May 30, 1981, May 31, 1980, and May 26, 1979, and the related statements of consolidated income and reinvested earnings and of consolidated changes in financial position for the years then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, such financial statements present fairly the financial position of the companies at May 28, 1983, May 29, 1982, May 30, 1981, May 31, 1980, and May 26, 1979, and the results of their operations and the changes in their financial position for the years then ended, in conformity with generally accepted accounting principles consistently applied during the period except for the change, with which we concur, in 1983 in the method of accounting for the effects of foreign currencies as described in the notes to the financial statements.

Deloitte Haskins + Sells

Portland, Oregon
August 1, 1983

Tektronix Consolidated Financial Position in thousands

1979	1980	1981	1982	1983	
$428,787	**$540,917**	**$573,791**	**$621,981**	**$639,680**	**CURRENT ASSETS** are cash and assets that should be converted to cash or used in operations within one year
41,788	57,145	47,862	73,331	96,867	CASH AND CASH EARNING INCOME — bank deposits and short-term investments
153,568	198,069	204,952	230,573	210,843	ACCOUNTS RECEIVABLE — due from customers after an allowance for doubtful accounts
214,533	263,563	293,705	290,268	292,885	INVENTORIES — materials, accumulated manufacturing costs and finished products awaiting sale
18,898	22,140	27,272	27,809	39,085	PREPAID EXPENSES — supplies and services that have not been used, and deposits that will be refunded
153,135	**193,831**	**214,527**	**233,267**	**197,428**	**CURRENT LIABILITIES** are obligations that are to be paid within one year
28,997	45,809	50,175	66,334	33,675	SHORT-TERM DEBT — borrowed for less than one year and that portion of long-term debt payable within a year
42,033	49,034	60,405	63,856	78,569	ACCOUNTS PAYABLE — owed for materials, services, interest and miscellaneous taxes
20,444	27,404	28,788	23,118	15,280	INCOME TAXES PAYABLE — to United States and foreign governments
61,661	71,584	75,159	79,959	69,904	ACCRUED COMPENSATION — payable to employees, and their retirement and incentive plans
275,652	**347,086**	**359,264**	**388,714**	**442,252**	**WORKING CAPITAL** is the current assets in excess of the current liabilities
194,454	276,771	340,912	379,122	397,290	FACILITIES — the cost of land, buildings and equipment after deducting accumulated depreciation
19,666	24,005	39,050	41,184	50,444	OTHER ASSETS — the equity in joint ventures, receivables not due within a year, and intangibles
62,094	136,196	146,143	132,060	152,342	LONG-TERM DEBT — funds borrowed for more than a year, less that portion due within a year
19,150	23,974	30,765	41,124	43,691	DEFERRED TAX LIABILITY — income taxes which have not become payable
5,728	4,354	4,774	5,387	32,258	OTHER LIABILITIES — incentive compensation and early retirement expense payable in future years
402,800	**483,338**	**557,544**	**630,449**	**661,695**	**SHAREOWNERS' EQUITY** is the book value owned by the shareowners.
31,950	41,844	52,515	64,277	78,097	SHARE CAPITAL — the proceeds of common shares sold less the cost of any shares repurchased
370,850	441,494	505,029	566,172	595,957	REINVESTED EARNINGS — accumulated earnings that have been reinvested in the business
				(12,359)	CURRENCY ADJUSTMENT — accumulated translation adjustment of foreign subsidiary financial statements
18,143	18,372	18,574	18,807	19,059	COMMON SHARES — the number of shares outstanding at year-end, of the forty million no par value shares authorized

The accompanying notes are an integral part of these financial statements.

Tektronix Consolidated Income and Reinvested Earnings in thousands

1979	1980	1981	1982	1983	
$786,936	**$971,306**	**$1,061,834**	**$1,195,748**	**$1,191,380**	**NET SALES** and rentals to customers for products, replacement components and services
359,740	458,464	513,145	595,340	615,941	COST OF SALES — the materials, labor and facilities related to manufacturing goods and providing services
427,196	**512,842**	**548,689**	**600,408**	**575,439**	**GROSS INCOME** remaining from sales revenue after production costs
60,561	77,797	91,147	109,086	125,393	ENGINEERING EXPENSE — for research and the development of products and components
113,461	135,405	157,105	180,631	185,355	SELLING EXPENSE — for marketing and sales programs, and the distribution system
68,044	88,343	100,715	108,977	120,920	ADMINISTRATIVE EXPENSE — for general management and supporting services
63,682	63,448	61,686	55,267	29,316	PROFIT SHARING — the incentive portion of employee compensation
121,448	**147,849**	**138,036**	**146,447**	**114,455**	**OPERATING INCOME** remaining from sales revenue after the costs and expenses of operations
6,428	15,956	25,274	29,537	25,832	INTEREST EXPENSE — the cost of borrowed funds and banking services
11,631	5,029	19,630	9,493	(25,509)	NON-OPERATING INCOME (EXPENSE) — investment income, joint venture earnings, and other income and expense
126,651	**136,922**	**132,392**	**126,403**	**63,114**	**INCOME BEFORE TAXES** remaining from sales revenue after operating costs and expenses and non-operating items
49,500	51,850	52,225	46,950	14,400	INCOME TAXES — provided for income related taxes levied by United States and foreign governments
77,151	**85,072**	**80,167**	**79,453**	**48,714**	**EARNINGS** remaining from sales revenue for reinvestment in the business and for dividends
302,364	370,850	441,494	505,029	566,172	REINVESTED EARNINGS — from prior years
(8,665)	(14,428)	(16,632)	(18,310)	(18,929)	DIVIDENDS — declared for payment to the shareowners
370,850	**441,494**	**505,029**	**566,172**	**595,957**	**REINVESTED EARNINGS** at year-end
18,031	18,264	18,482	18,691	18,937	AVERAGE SHARES — weighted for the number of common shares outstanding during the year
$4.28	**$4.66**	**$4.34**	**$4.25**	**$2.57**	**EARNINGS PER SHARE** — the earnings allocated to each of the weighted average common shares outstanding
.60	.79	.90	.98	1.00	DIVIDENDS PER SHARE — received by the shareowners

The accompanying notes are an integral part of these financial statements.

Tektronix Consolidated Changes in Financial Position in thousands

1979	1980	1981	1982	1983	
$96,385	**$117,472**	**$121,934**	**$144,690**	**$141,886**	**FUNDS FROM OPERATIONS**
77,151	85,072	80,167	79,453	48,714	EARNINGS
21,258	30,303	42,228	56,473	66,710	DEPRECIATION EXPENSE
(5,145)	(2,727)	(7,252)	(1,595)	(2,423)	JOINT VENTURE EARNINGS-NET
3,121	4,824	6,791	10,359	2,567	DEFERRED INCOME TAXES
				26,318	UNFUNDED EARLY RETIREMENT
44,598	**89,230**	**10,598**	**(2,754)**	**(13,258)**	**NET FUNDS FROM FINANCING**
18,646	16,812	4,366	16,159	(30,635)	SHORT-TERM DEBT
(1,097)	(652)	(20,717)	(35,694)	(2,961)	LONG-TERM DEBT DUE WITHIN YEAR
28,096	77,604	32,910	23,329	25,447	LONG-TERM DEBT ADDITIONS
7,618	9,894	10,671	11,762	13,820	SHARE CAPITAL
(8,665)	(14,428)	(16,632)	(18,310)	(18,929)	DIVIDENDS
(165,403)	**(191,345)**	**(141,815)**	**(116,467)**	**(105,092)**	**OTHER CHANGES IN FINANCIAL POSITION**
(38,468)	(44,501)	(6,883)	(25,621)	19,730	ACCOUNTS RECEIVABLE
(51,010)	(49,030)	(30,142)	3,437	(2,617)	INVENTORIES
(6,025)	(3,242)	(5,132)	(537)	(11,276)	PREPAID EXPENSES
8,925	7,001	11,371	3,451	14,713	ACCOUNTS PAYABLE
1,986	6,960	1,384	(5,670)	(7,838)	INCOME TAXES PAYABLE
16,022	9,923	3,575	4,800	(10,055)	ACCRUED COMPENSATION
(100,349)	(115,926)	(114,065)	(102,410)	(93,325)	FACILITIES EXPENDITURES
				(12,359)	CURRENCY ADJUSTMENT
3,516	(2,530)	(1,923)	6,083	(2,065)	OTHER ITEMS
(24,420)	**15,357**	**(9,283)**	**25,469**	**23,536**	**CHANGES IN CASH AND CASH EARNING INCOME**

The accompanying notes are an integral part of these financial statements.

Tektronix Consolidated Notes to Financial Statements

ACCOUNTING POLICIES

Principles of Consolidation — The consolidated financial statements include the accounts of Tektronix, Inc. and its wholly owned subsidiaries (the Company) since dates of organization or acquisition. All material intercompany transactions and balances have been eliminated.

Joint Venture Companies — Investments in joint venture companies, where the Company holds fifty percent or less of the share capital, are stated at cost plus the Company's equity in their reinvested earnings. All material intercompany income has been eliminated.

Foreign Currencies — Prior to 1983 foreign affiliate monetary assets and liabilities were translated into United States dollars at the period-end rate of exchange, while other assets and liabilities were carried at their historic values. Income was translated at average exchange rates. Translation gains and losses were included in non-operating income. Foreign manufacturing operations, and sales operations in highly inflationary economies, continue to use this translation method. Beginning in 1983 most foreign sales operations financial statements are translated into United States dollars at current rates of exchange with changes in exchange rates reflected in the currency adjustment to shareowners' equity. Transaction gains and losses are included in non-operating income.

Inventories — United States inventories are stated at the lower of market or cost, with cost determined on the last-in, first-out basis (LIFO). Foreign inventories are stated at the lower of market or cost on the first-in, first-out basis (FIFO).

Facilities and Depreciation — Facilities are stated at their original cost when acquired. Depreciation for financial accounting purposes is generally provided by accelerated methods over the estimated useful lives of the facilities ranging from 10 to 48 years for buildings and 3 to 15 years for equipment. Leasehold improvements are amortized on a straight-line basis over the estimated useful life or the lease term, whichever is less. Depreciation and amortization for tax reporting is provided over the shortest allowable lives.

Engineering Expense — Expenditures for research, development and engineering of products and manufacturing processes are expensed as incurred.

Pension Expense — Pension expense is funded as accrued, including amortization of past service cost by the declining balance method over 20 years.

Income Taxes — Investment tax credits reduce income taxes in the year the related facility is placed in service. Tax deferral resulting from Domestic International Sales Corporation subsidiaries is recognized in the provision for income taxes and included in the deferred tax liability.

Per Share Amounts — The earnings per share are based on the weighted average number of shares outstanding during the fiscal year.

Fiscal Year — The Company's fiscal year is the 52 or 53 weeks ending the last Saturday in May. The 52 week years are comprised of 13 four-week accounting periods separated into two 12-week quarters ending during August and November, a 16-week quarter ending during March, and a 12-week quarter ending during May. A 53-week year results in a five-week accounting and a 12-week quarter at the beginning of the fiscal year. 1980 was a 53 week fiscal year.

Rounding — All financial amounts, except per share, are rounded to the nearest one thousand dollars in the financial statements and tables to the notes.

ACCOUNTING CHANGE

The Company adopted the Financial Accounting Standard 52 method of accounting for the effects of foreign currencies in 1983. In applying this method, an adjustment of $12,359,000 was made to shareowners' equity, of which $4,542,000 relates to beginning of year adjustments. This adjustment recognizes the negative impact of changing exchange rates in the translation to United States dollars of those foreign subsidiaries that function in their local currency. Included in non-operating income is an additional $3,035,000 loss on currencies made up of a $1,248,000 loss from translating the financial statements of foreign subsidiaries where the functional currency is the United States dollar, $4,072,000 loss from translating non-local currency obligations, and a gain of $2,285,000 from the actual exchange of currencies. The Company did not apply this change in accounting to prior years.

BUSINESS SEGMENTS

The Company and its joint venture affiliates operate predominantly in a single industry segment: The design, manufacture, sale and service of electronic measurement, display and control instruments and systems used in science, industry and education.

Geographically the Company operates primarily in the industrialized world. Sales, income and assets in the United States, Europe and other geographic areas were:

1979	1980	1981	1982	1983	
$487,172	$591,760	$ 625,335	$ 729,369	$ 734,223	U.S. sales to customers
47,167	57,805	71,714	89,212	89,941	U.S. export sales to customers
147,414	185,772	219,976	237,339	228,393	U.S. transfers to affiliates
681,753	835,337	917,025	1,055,920	1,052,557	U.S. sales
225,388	288,630	322,900	328,469	324,273	European sales to customers
1,665	577	2,665	25,756	18,650	European transfers to affiliates
227,053	289,207	325,565	354,225	342,923	European sales
27,209	33,111	41,885	48,699	42,943	Other area sales to customers
(149,079)	(186,349)	(222,641)	(263,096)	(247,043)	Inter-area eliminations
$786,936	$971,306	$1,061,834	$1,195,748	$1,191,380	Net sales
$102,702	$123,170	$ 118,688	$ 121,547	$ 85,151	U.S. operating income
28,506	34,002	30,132	31,363	36,233	European operating income
1,418	2,139	3,768	4,186	3,829	Other area operating income
(6,025)	(5,529)	(8,412)	(2,937)	(1,461)	Inter-area eliminations
126,601	153,782	144,176	154,159	123,752	Area operating income
(5,153)	(5,933)	(6,140)	(7,712)	(9,297)	General corporate expense
(6,428)	(15,956)	(25,274)	(29,537)	(25,832)	Interest expense
11,631	5,029	19,630	9,493	(25,509)	Non-operating income
$126,651	$136,922	$ 132,392	$ 126,403	$ 63,114	Income before taxes
$464,330	$607,686	$ 680,138	$ 748,140	$ 783,598	U.S. assets
120,525	156,444	198,702	192,785	184,137	European assets
11,554	13,203	16,383	18,042	14,664	Other area assets
(8,571)	(11,027)	(14,395)	(15,992)	(16,630)	Inter-area eliminations
587,838	766,306	880,828	942,975	965,769	Area assets
17,030	19,759	27,011	29,377	31,585	Joint venture equity
38,039	55,628	45,914	69,935	90,060	Corporate cash earning income
$642,907	$841,693	$ 953,753	$1,042,287	$1,087,414	Assets at year-end

Transfers of products and services are made at arms-length prices between geographic areas. The profit on transfers between geographic areas is not recognized by the manufacturer until sales are made to unaffiliated customers. Area operating income includes all directly incurred and allocable costs, except identified corporate expenses. Identifiable assets are those which are specifically associated with the operations of each geographic area.

Net sales to United States or foreign government agencies were not more than ten percent of consolidated net sales in any of the past five years, and no other customer accounted for more than four percent of sales.

FOREIGN AFFILIATES

The Company has 18 foreign operating subsidiaries located in Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Guernsey, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom with a branch in Ireland. The assets, liabilities, sales and income of foreign subsidiaries are include in the consolidated financial statements in these amounts:

1979	1980	1981	1982	1983	
$141,446	$169,051	$208,864	$218,375	$233,030	Current assets
39,090	55,483	68,207	68,548	69,334	Current liabilities
18,585	22,185	28,938	34,787	29,727	Facilities less depreciation
1,118	907	410	603	95	Other assets
6,732	7,857	8,228	9,449	7,598	Other liabilities
$252,597	$321,741	$364,785	$377,167	$367,215	Net sales
77,878	97,367	105,403	109,479	106,268	Gross income
29,941	37,446	34,285	30,808	34,760	Operating income
31,809	39,781	33,301	31,948	34,916	Income before taxes
22,853	29,882	19,401	21,048	21,787	Earnings

The Company has investments in three joint venture companies in Austria, Japan and Mexico. The Company's share of the assets, liabilities, sales and income of these unconsolidated affiliates consisted of:

1979	1980	1981	1982	1983	
$ 21,713	$ 24,873	$ 32,173	$ 33,429	$ 31,166	Current assets
10,936	12,903	16,892	16,166	15,149	Current liabilities
3,939	5,477	8,686	9,114	13,023	Facilities less depreciation
3,202	3,063	4,236	3,895	4,213	Other assets
1,145	1,558	1,417	1,237	1,560	Other liabilities
$ 40,551	$ 46,064	$ 59,660	$ 61,520	$ 57,368	Net sales
16,740	16,107	23,728	21,613	18,668	Gross income
10,385	8,859	14,181	11,161	7,761	Operating income
10,618	8,041	15,575	10,419	7,966	Income before taxes
5,222	2,930	7,597	4,023	3,636	Earnings

The Company had arms-length sales to, purchases from, and accounts receivable due from joint venture companies amounting to:

1979	1980	1981	1982	1983	
$ 34,904	$ 44,764	$ 54,130	$ 59,244	$ 56,136	Sales to
6,106	8,628	10,954	10,665	9,288	Purchases from
6,458	8,487	10,143	11,803	9,840	Accounts receivable

There are no significant restrictions which prevent dividends to the parent company from subsidiary or joint venture companies.

ACCOUNTS RECEIVABLE

The accounts receivable have been reduced by an allowance for doubtful accounts which was $1,752,000 in 1979, $2,022,000 in 1980, $2,177,000 in 1981, $2,186,000 in 1982, and $2,092,000 in 1983. The net charges to this reserve for uncollected credit sales were not material.

INVENTORIES

The inventories valued on a first-in, first-out basis (FIFO) approximate current cost. These inventories, less the reserve for inventories adjusted to the last-in, first-out basis (LIFO), consisted of:

1979	1980	1981	1982	1983	
$ 43,989	$ 62,197	$ 57,698	$ 42,895	$ 49,290	Purchased materials
128,926	169,706	196,925	220,735	229,747	Work-in-process
66,567	81,388	115,181	130,221	126,470	Finished goods
239,482	313,291	369,804	393,851	405,507	Inventories at FIFO
(24,949)	(49,728)	(76,099)	(103,583)	(112,622)	LIFO reserve
$214,533	$263,563	$293,705	$290,268	$292,885	Inventories

FACILITIES AND DEPRECIATION

The original cost of facilities, additions and disposals consisted of:

1979	1980	1981	1982	1983	
$ 6,511	$ 8,240	$ 15,524	$ 27,656	$ 28,251	Land at prior year-end
1,880	7,360	12,668	1,200	1,698	Additions
(151)	(76)	(536)	(605)	(382)	Dispositions
8,240	15,524	27,656	28,251	29,567	Land at year-end
83,598	102,976	163,598	195,132	211,945	Buildings at prior year-end
20,460	61,057	34,935	17,790	20,195	Additions
(1,082)	(435)	(3,401)	(977)	(3,851)	Dispositions
102,976	163,598	195,132	211,945	228,289	Buildings at year-end
102,122	142,257	193,514	254,126	322,282	Equipment at prior year-end
48,513	59,342	69,119	82,194	82,828	Additions
(8,378)	(8,085)	(8,507)	(14,038)	(13,315)	Dispositions
142,257	193,514	254,126	322,282	391,795	Equipment at year-end
12,462	41,958	30,125	27,468	28,694	Construction at prior year-end
29,496	(11,833)	(2,657)	1,226	(11,396)	Net changes
41,958	30,125	27,468	28,694	17,298	Construction at year-end
$295,431	$402,761	$504,382	$591,172	$666,949	Facilities

Facilities and Depreciation continued

The accumulated depreciation, depreciation expense and depreciation related to disposals consisted of:

1979	1980	1981	1982	1983	
$ 28,887	$ 32,331	$ 37,462	$ 44,736	$ 53,769	For buildings at prior year-end
3,648	5,346	7,535	9,317	9,915	Depreciation expense
(204)	(215)	(261)	(284)	(1,138)	Depreciation related to dispositions
32,331	37,462	44,736	53,769	62,546	For buildings at year-end
56,273	68,646	88,528	118,734	158,281	For equipment at prior year-end
17,610	24,957	34,693	47,156	56,795	Depreciation expense
(5,237)	(5,075)	(4,487)	(7,609)	(7,963)	Depreciation related to dispositions
68,646	88,528	118,734	158,281	207,113	For equipment at year-end
$100,977	$125,990	$163,470	$212,050	$269,659	Accumulated depreciation

OTHER ASSETS

The other long-term assets consisted of:

1979	1980	1981	1982	1983	
$17,030	$19,759	$27,011	$29,377	$31,585	Investments in joint-venture companies
1,118	1,661	1,993	3,506	2,498	Long-term contracts receivable
				10,008	Deferred profit sharing
1,518	2,585	10,046	8,301	6,353	Goodwill and other intangibles
$19,666	$24,005	$39,050	$41,184	$50,444	Other assets

SHORT-TERM DEBT

The Company has lines of credit with United States and foreign banks which aggregated $112 million at May 28, 1983, of which approximately $81 million was unused. The charges are not significant for those lines that are fee compensated. A summary of short-term borrowings was:

1979	1980	1981	1982	1983	
					Bank borrowings at year-end:
$17,900	$17,457	$29,458	$30,640	$30,714	Outstanding
11.1%	16.2%	17.1%	16.0%	13.9%	Average interest rate
					At accounting period-end:
$13,072	$17,541	$23,144	$29,855	$30,080	Average outstanding
10.0%	13.0%	15.7%	15.5%	15.1%	Average interest rate
$20,415	$24,981	$31,224	$45,312	$38,320	Maximum outstanding
					Commercial paper borrowings at year-end:
$10,000	$27,700				Outstanding
10.0%	11.4%				Average interest rate
					At accounting period-end:
$ 714	$49,763				Average outstanding
10.0%	15.2%				Average interest rate
$10,000	$83,100				Maximum outstanding

LONG-TERM DEBT

The long-term indebtedness consisted of:

1979	1980	1981	1982	1983	
		$ 31,000	$ 51,900	$ 74,500	Commercial paper borrowings
	$ 75,000	75,000	75,000	75,000	11% Notes due July 15, 1990
$35,000	35,000	35,000	35,000		8⅞% Notes due May 15, 1983
20,000	20,000	20,000			9⅛% Note due November 15, 1981
8,191	6,848	5,860	5,854	5,803	Other borrowings
63,191	136,848	166,860	167,754	155,303	Long-term borrowings
(1,097)	(652)	(20,717)	(35,694)	(2,961)	Current maturities
$62,094	$136,196	$146,143	$132,060	$152,342	Long-term debt

The commercial paper borrowings, with a weighted average interest rate of 8.6% at year-end, have been supported by revolving credit commitments since 1981. These commitments aggregated $115 million at May 28, 1983, and are convertible to four-year term loans in 1985. The Company intends to replace these commercial paper borrowings at some future time with long-term financing.

The 11% Notes may be redeemed at any time at the option of the Company on or after July 15, 1986, at the principal amount together with accrued interest.

Aggregate long-term debt and early retirement principal payments for each of the next five years will be $7,144,000 in 1984, $8,324,000 in 1985, $26,761,000 in 1986, $29,043,000 in 1987, and $20,795,000 in 1988.

COMMITMENTS

The Company is committed under operating leases for buildings and equipment in the aggregate amount of $41,339,000; payable $11,349,000 in 1984, $8,018,000 in 1985, $5,697,000 in 1986, $3,423,000 in 1987, $2,441,000 in 1988, and $10,411,000 thereafter.

The cost to complete facilities projects authorized at May 28, 1983 is approximately $58 million.

CONTINGENT LIABILITY

The United States Government claims additional discounts for purchases of the Company's products under General Services Administration supply contracts for the three years ending in 1980. The Company believes that these claims will be resolved in a manner that will not have a material effect on its results of operations or financial position.

EXPENSE SUPPLEMENT

A summary of selected expense categories is:

1979	1980	1981	1982	1983	
$10,416	$12,393	$14,169	$15,166	$16,432	Advertising expense
22,454	31,477	36,433	38,006	38,881	Maintenance and repair expense
8,199	12,322	16,179	17,582	16,294	Rental expense

PENSION PLANS

The parent company and a domestic subsidiary have defined benefit pension plans which are integrated with social security and cover all United States employees. The weighted average assumed rate of return used in determining the actuarial present value of accumulated plan benefits is 7.5%. The actuarial present value of accumulated plan benefits, the plan net assets available for benefits and pension expenses were:

1979	1980	1981	1982	1983	
		$39,577	$48,788	$103,961	Vested benefits
		11,864	13,725	12,875	Non-vested benefits
		$51,441	$62,513	$116,836	Plan benefit value
$30,079	$42,145	$60,205	$78,262	$143,011	Plan net assets available for benefits
8,475	9,406	12,172	14,857	48,248	Pension expenses

Included in 1983 pension expense is $30,500,000 providing a pension supplement for employees who accepted a one-time early retirement opportunity which reduced earnings $11,100,000 ($.59 per share). This obligation accrues interest at 10.75% and the long-term unfunded portion of this expense, $26,318,000, is included in other liabilities.

Foreign subsidiaries provide for employee retirement in keeping with the practices and laws of the countries in which they operate. Foreign plans are not considered to be material and are not required to report to United States government agencies. Foreign subsidiary pension expenses were $1,924,000 in 1979, $2,360,000 in 1980, $2,733,000 in 1981, $2,900,000 in 1982, and $3,116,000 in 1983.

Amounts owing under pension and incentive plans, included in accrued compensation, were $31,691,000 in 1979, $33,964,000 in 1980, $33,870,000 in 1981, $31,078,000 in 1982, and $24,303,000 in 1983.

INCENTIVE PLANS

As a part of compensation, most employees receive cash and deferred profit share amounting to 27.5% of income of participating companies before profit sharing, incentive compensation, charitable contributions and income taxes. Additional profit share of 7.5% is contributed to a retirement trust for parent company employees.

The Company has incentive compensation plans for executives. The plans provide for compensation based on financial performance over a three-year period. Provision for this expense is included in profit sharing.

The Company has stock option plans for selected employees. At May 28, 1983, 1,044,984 common shares were reserved for issuance under these plans. There were 527,013 shares subject to outstanding options, of which 227,181 were exercisable. The outstanding options are held by 536 participants, are exercisable at prices from $12.13 to $65.50, and expire between August 29, 1984 and May 3, 1993. There is no material potential dilution to earnings per share from unexercised stock options. The options that have been exercised under these and prior plans are:

1979	1980	1981	1982	1983	
110,417	64,750	33,294	6,740	38,321	Number of shares
$ 1,855	$ 1,022	$ 757	$ 108	$ 2,039	Option value

The stock option plans allow stock appreciation rights to be granted to participants. When granted, all or part of an option may be surrendered for shares or payment in an amount equal to the difference between the option price and the market price of the option right surrendered. Provision for the difference between current market price and option price of outstanding stock appreciation rights is included in profit sharing.

Incentive Plans continued

Profit sharing expense consisted of:

1979	1980	1981	1982	1983	
$48,521	$50,599	$48,166	$45,393	$20,631	Cash and deferred profit share
12,176	12,668	12,067	11,934	5,092	Retirement profit share
869	181	(218)		189	Incentive compensation provision
2,116		1,671	(2,060)	3,404	Stock appreciation rights provision
$63,682	$63,448	$61,686	$55,267	$29,316	Profit sharing

Employees of the parent company and a domestic subsidiary are eligible to participate in an Employee Share Purchase Plan in which 4,358 employees were participants, of 17,072 eligible employees, at May 28, 1983. Under the Plan 639,556 common shares of the Company were reserved at May 28, 1983 and 102,876 at May 29, 1982. During 1983, 213,320 shares with a market value of $11,781,000 were issued for $9,425,000, while 226,966 shares with a market value of $11,654,000 were issued for $9,323,000 in 1982. The share purchase discount provided in the plan has been charged to non-operating income.

NON-OPERATING INCOME

The non-operating sources of income and expense which comprise non-operating income consisted of:

1979	1980	1981	1982	1983	
$ 3,448	$ 4,593	$ 8,183	$10,447	$ 8,965	Investment income
5,222	2,930	7,597	4,023	3,636	Equity in joint venture earnings
435	1,729	(3,309)	(2,679)	(3,035)	Currency gains (losses)
(1,981)	(4,223)	(3,379)	(2,298)	(4,575)	Other income (expense)—net
4,507		10,538		(30,500)	Non-recurring income (expense)
$11,631	$ 5,029	$19,630	$ 9,493	$(25,509)	Non-operating income (expense)

The non-recurring income is the satisfaction of a patent infringement judgment in 1979, and the sale of the Company's patient monitoring business in 1981. The non-recurring expense is the actuarial cost of an early retirement program in 1983.

INCOME TAXES

The provision for income taxes consisted of:

1979	1980	1981	1982	1983	
$33,422	$34,468	$31,225	$28,950	$ (1,772)	United States
7,122	7,483	7,100	7,100	3,043	State
8,956	9,899	13,900	10,900	13,129	Foreign
49,500	51,850	52,225	46,950	14,400	Income taxes provided
(1,040)	(3,946)	(4,386)	(4,444)	(3,122)	Undistributed subsidiary earnings
			(4,667)	(4,808)	Depreciation timing differences
				8,721	Early retirement program
(2,081)	(878)	(2,405)	(1,248)	(3,358)	Other tax deferrals
(3,121)	(4,824)	(6,791)	(10,359)	(2,567)	Income taxes deferred
				12,250	Prepaid for inventory obsolescence
$46,379	$47,026	$45,434	$36,591	$24,083	Income taxes currently payable

The above provisions were less than the amounts which would result by applying the United States statutory rate to income before income taxes. A reconciliation of the difference was:

1979	1980	1981	1982	1983	
$59,779	$62,984	$60,901	$58,145	$29,032	Income taxes based on U.S. statutory rate
			(3,821)	(3,618)	U.S. research and experimentation tax credits
(3,786)	(5,296)	(5,258)	(6,041)	(6,517)	U.S. investment tax credits
(1,903)	(556)	(2,204)	2,054	1,094	Other U.S. adjustments
3,754	4,052	3,833	3,829	1,643	State income taxes, net of U.S. tax
(5,879)	(7,986)	(1,552)	(5,365)	(5,561)	Effect of foreign subsidiaries taxed below U.S. rate
(2,465)	(1,348)	(3,495)	(1,851)	(1,673)	Effect of after tax joint venture earnings
$49,500	$51,850	$52,225	$46,950	$14,400	Income taxes

Undistributed reinvested earnings of foreign subsidiaries and Domestic International Sales Corporations amounted to approximately $292 million at May 28, 1983. Except for accumulated deferred income tax provisions of $35 million, primarily for Domestic International Sales Corporations, relating to approximately $99 million of such reinvested earnings, no provision has been made for additional United States income taxes which could result from the transfer of undistributed reinvested earnings to the parent company. If the undistributed reinvested earnings were to be transferred, foreign tax credits would be available to partially offset the amount of United States income taxes otherwise payable. The Company has no present intention of transferring such earnings.

Equity in the reinvested earnings of joint venture companies amounted to approximately $32 million at May 28, 1983. No provision has been made for United States income taxes which could result from the transfer of such earnings because foreign tax credits would be available to offset the amount of United States income taxes otherwise payable.

INFLATION (Unaudited)

The effects of inflation are not apparent in traditional financial statements which are based on historical cost. The Company has attempted to identify the financial effects of changing prices using the current cost method which is dependent upon estimates, approximations and assumptions. In as much as a significant part of the Company's operations are now measured in functional currencies other than the U.S. dollar, the data which follows has been revised from that reported in previous years to reflect the eliminations of certain constant dollar information and the change in method of translating foreign currency financial statements.

The current cost method measures changes in specific prices for the inventories and facilities used in the Company's operations, using appropriate price indexes. The effect of general inflation on the current cost information is based on the U.S. Consumer Price Index for All Urban Consumers and is measured after translation of foreign currency financial statements.

Adjustments to the historical cost statements are necessary to restate financial information under the current cost method. Cost of sales is revised to reflect changes in inventory prices for foreign inventories which are not on the last-in, first-out (LIFO) basis. No adjustment is required for United States inventories which are valued on the LIFO basis, because historical cost of sales approximates current cost. Depreciation expense is adjusted to reflect increased costs to construct facilities at current prices. This revision is based on the same depreciation methods, useful lives and salvage values as used in the historical cost statements. Income taxes are not adjusted because current tax laws do not recognize the effects of inflation.

Inflation also causes gains or losses in the purchasing power of monetary items which are money or a claim to receive or pay money in an amount which is presently fixed or determinable. Since the Company owes more to its creditors than it holds in cash and has due from customers, a future gain occurs as these creditors are paid with money that has declined in purchasing power as measured in inflated dollars.

This selected financial information, stated in average 1983 dollars, has been adjusted for the effects of changing prices:

1979	1980	1981	1982	1983	
$1,134,510	$1,238,994	$1,209,782	$1,251,589	$1,191,380	Net sales
	108,520	91,338	83,163	48,714	Earnings
					Adjustments for:
	(3,913)	(2,908)	(1,554)	1,358	Cost of sales before depreciation
	(11,953)	(10,414)	(10,608)	(10,960)	Depreciation expense
	$ 92,654	$ 78,016	$ 71,001	$ 39,112	Earnings adjusted for specific prices
	$ 748,045	$ 800,729	$ 870,186	$ 887,034	Shareowners' equity
				(6,647)	Aggregate currency adjustment
	6,872	9,185	6,200	1,972	Gain from decline in purchasing power
	33,424	22,316	(1,704)	11,687	Excess of the increase of general inflation over specific prices for inventories and facilities
	5.08	4.23	3.80	2.07	Earnings per share
.68	1.00	1.03	1.03	1.00	Dividends per share
67.45	59.60	66.26	53.78	73.08	Share price at year-end
203.5	230.0	257.5	280.3	293.4	Average consumer price index

At May 28, 1983, the current cost of inventories was $399,895,000, and facilities was $494,805,000. The 1983 increase in specific prices for inventories and facilities aggregated, in average 1983 dollars, $19,534,000 which is $11,687,000 less than the increase attributable to general inflation. The difference results because the costs of materials and components used in the design and manufacture of the Company's products have not increased as much as general price levels.

QUARTERLY FINANCIAL SUMMARY (Unaudited)

In the opinion of management, this unaudited quarterly financial summary includes all adjustments necessary to present fairly the results for the periods represented:

12 Weeks to Aug. 22, 1981	12 Weeks to Nov. 14, 1981	16 Weeks to Mar. 6, 1982	12 Weeks to May 29, 1982	52 Weeks to May 29, 1982	
$252,212	$276,567	$347,873	$319,096	$1,195,748	Net sales
129,125	138,637	175,157	157,489	600,408	Gross income
33,831	33,004	40,666	38,946	146,447	Operating income
26,548	27,296	37,602	34,957	126,403	Income before taxes
19,098	15,906	23,652	20,797	79,453	Earnings
1.03	.85	1.26	1.11	4.25	Earnings per share
.23	.25	.25	.25	.98	Dividends per share

Quarterly Financial Summary continued

12 Weeks to Aug. 21, 1982	12 Weeks to Nov. 13, 1982	16 Weeks to Mar. 5, 1983	12 Weeks to May 28, 1983	52 Weeks to May 28, 1983	
$259,792	$273,848	$373,036	$284,704	$1,191,380	Net sales
127,933	137,581	185,229	124,696	575,439	Gross income
27,094	25,755	49,276	12,330	114,455	Operating income
19,329	22,489	15,550	5,746	63,114	Income before taxes
11,929	14,678	13,711	8,396	48,714	Earnings
.63	.78	.72	.44	2.57	Earnings per share
.25	.25	.25	.25	1.00	Dividends per share

Earnings for the quarter ended August 22, 1981 were significantly affected by the recognition of income tax benefits relating to inventory deductions in the United Kingdom. The consolidated effective tax rate was reduced in the quarter ended March 5, 1983 because of an early retirement program, and in the quarter ended May 28, 1983 because of inventory obsolescence which affected United States taxable income.

COMMON SHARE PRICES

The Company's common shares are traded on the New York and Pacific Stock Exchanges. There were 6,444 share owners of record at August 1, 1983. The market price range and close are the composite prices reported by The Wall Street Journal rounded to full cents per share:

1979	1980	1981	1982	1983	
					First fiscal quarter:
$46.88	$59.50	$70.25	$61.50	$54.38	Highest trade
40.00	48.63	47.50	47.25	34.00	Lowest trade
46.00	57.25	67.63	47.38	37.00	Closing share price
					Second fiscal quarter:
50.50	61.50	69.88	54.75	54.00	Highest trade
39.00	53.25	59.25	45.13	36.75	Lowest trade
43.25	59.00	65.50	53.00	50.75	Closing share price
					Third fiscal quarter:
54.00	64.25	68.50	56.00	75.75	Highest trade
41.50	51.00	50.50	45.00	48.50	Lowest trade
51.38	51.13	52.63	45.00	75.00	Closing share price
					Fourth fiscal quarter:
57.00	52.00	63.25	56.25	76.50	Highest trade
46.88	41.63	51.75	42.38	61.00	Lowest trade
49.25	49.75	60.75	52.63	74.00	Closing share price

DIVIDEND POLICY

Dividends are paid at the discretion of the Board of Directors dependent upon their judgment of future earnings, capital expenditures and financial condition.

Tektronix Consolidated Financial Performance

1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	
21.38	**18.69**	**30.13**	**33.88**	**40.50**	**49.25**	**49.75**	**60.75**	**52.63**	**74.00**	**SHARE PRICE AT YEAR-END**
24.8%	−12.6%	61.2%	12.4%	19.5%	21.6%	1.0%	22.1%	−13.4%	40.6%	Market appreciation
.6%	.5%	.6%	.7%	1.4%	1.5%	1.6%	1.8%	1.6%	1.9%	Dividend yield
12.9%	**13.9%**	**13.9%**	**17.4%**	**18.9%**	**21.2%**	**19.2%**	**15.4%**	**13.4%**	**7.5%**	**RETURN ON EQUITY**
7.9%	7.8%	8.2%	9.7%	9.5%	9.8%	8.8%	7.5%	6.6%	4.1%	Earnings margin
1.67x	1.78x	1.69x	1.80x	1.99x	2.16x	2.19x	2.04x	2.01x	1.84x	Equity turnover
11.9%	**12.6%**	**12.3%**	**15.4%**	**16.9%**	**18.4%**	**15.8%**	**12.7%**	**11.6%**	**7.4%**	**RETURN ON CAPITAL**
8.0%	8.3%	8.7%	10.0%	9.8%	10.1%	9.4%	8.5%	7.7%	5.2%	Preinterest margin
1.50x	1.52x	1.41x	1.53x	1.73x	1.81x	1.68x	1.50x	1.51x	1.42x	Capital turnover
297,000	**329,000**	**376,000**	**513,000**	**650,000**	**847,000**	**1,049,000**	**1,040,000**	**1,221,000**	**1,124,000**	**CUSTOMER ORDERS**
28.0%	10.8%	14.3%	36.4%	26.7%	30.3%	23.8%	−.9%	17.4%	−7.9%	Increase
24.9%	18.5%	18.6%	25.0%	27.5%	28.2%	30.2%	28.4%	26.3%	22.5%	Orders unfilled at year-end
271,428	**336,645**	**366,645**	**454,958**	**598,886**	**786,936**	**971,306**	**1,061,834**	**1,195,748**	**1,191,380**	**NET SALES**
33.8%	24.0%	8.9%	24.1%	31.6%	31.4%	23.4%	9.3%	12.6%	−.4%	Increase
49.9%	51.4%	53.8%	56.9%	55.5%	54.3%	52.8%	51.7%	50.2%	48.3%	Gross income margin
14.2%	15.1%	15.8%	16.8%	15.7%	15.4%	15.2%	13.0%	12.2%	9.6%	Operating income margin
14.2%	13.9%	15.1%	16.6%	16.0%	16.1%	14.1%	12.5%	10.6%	5.3%	Pretax income margin
44.5%	43.8%	45.5%	41.9%	40.8%	39.1%	37.9%	39.4%	37.1%	22.8%	Income tax rate
21,353	**26,329**	**30,089**	**43,971**	**56,846**	**77,151**	**85,072**	**80,167**	**79,453**	**48,714**	**EARNINGS**
27.6%	23.3%	14.3%	46.1%	29.3%	35.7%	10.3%	−5.8%	−0.9%	−38.7%	Increase
1.23	1.52	1.71	2.49	3.19	4.28	4.66	4.34	4.25	2.57	Earnings per share
.10	.10	.12	.225	.48	.60	.79	.90	.98	1.00	Dividends per share
251,061	**306,616**	**344,860**	**415,328**	**491,130**	**642,907**	**841,693**	**953,753**	**1,042,287**	**1,087,414**	**TOTAL ASSETS**
1.20x	1.21x	1.13x	1.20x	1.32x	1.39x	1.31x	1.18x	1.20x	1.12x	Asset turnover
5.50x	5.78x	5.58x	5.78x	5.92x	5.86x	5.52x	5.27x	5.49x	5.40x	Receivable turnover
3.27x	3.30x	3.52x	4.18x	4.25x	4.16x	4.06x	3.81x	4.10x	4.09x	Inventory turnover
5.10x	4.68x	4.28x	4.95x	5.57x	5.01x	4.12x	3.44x	3.32x	3.07x	Facility turnover
199,461	**244,906**	**273,659**	**319,287**	**374,133**	**493,891**	**665,343**	**753,862**	**828,843**	**847,712**	**INVESTED CAPITAL**
11.7%	5.2%	1.1%	1.7%	2.8%	5.9%	6.9%	6.7%	8.0%	4.0%	Short-term debt
.3%	12.2%	14.1%	12.5%	9.9%	12.6%	20.5%	19.4%	15.9%	18.0%	Long-term debt
88.0%	82.6%	84.8%	85.8%	87.3%	81.5%	72.6%	73.9%	76.1%	78.0%	Shareowners' equity
12,693	12,664	12,970	14,637	19,147	21,291	23,890	24,028	23,231	21,078	Employees
2,940	3,420	3,705	3,906	3,987	4,935	5,921	7,300	7,486	7,785	Square feet in use

Returns, ratios and turnovers are based on average assets and capital. Amounts are in thousands except per share and employees.

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