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Sigma

The scope guys

The original out-of-towners

Beaverton's calling

The Scope Guys - Displacing Dumont and

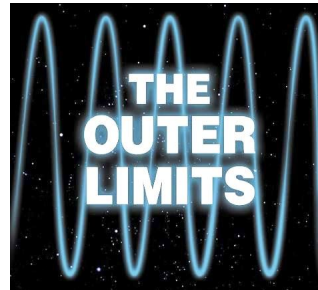
From the Trenches

Early piece of electronic test equipment
Dumont Oscilloscope

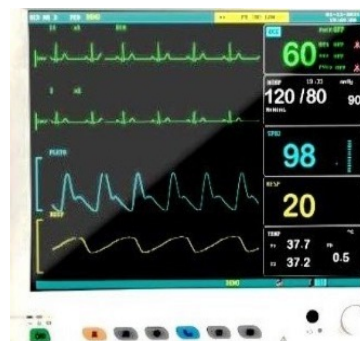


Early Dumont Scope

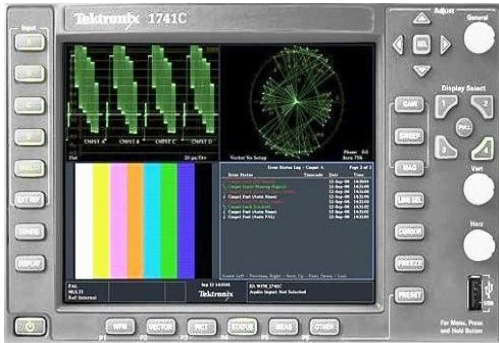
For those of a certain age, or just those who have seen the reruns,



you have seen a display of a very common piece of electronic test equipment, the show was the Outer Limits, and its open displayed an oscilloscope capturing the voice pattern of the narrator. An early Simpson's Halloween episode parodied this. An oscilloscope display has two axis. Horizontally represents time, and vertically the amplitude of the observed signal. There are many specialized versions of the oscilloscope, from waveform monitors that the television industry uses, automotive testers used to troubleshoot vehicles, to heart monitors used by the medical industry, to name a few. The traditional radar screen is a relative to the oscilloscope.



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Modern iterations of the "scope"

To quote from Tektronix itself: "Tektronix oscilloscopes and related test and measurement equipment have been a cornerstone of the electronics industry for nearly three quarters of a century. Engineers use Tektronix products to advance the state of the art. The oscilloscope enables visualization and precise measurements of electronic devices, circuits, and systems."



A Braun Tube

The oscilloscope, or simply "scope" as it is used in the vernacular, developed around something referred to as the

Braun tube, which came into being in the very late 1800s. The Braun tube evolved into the cathode ray tube (CRT). In 1899 Jonathan Zenneck equipped it with

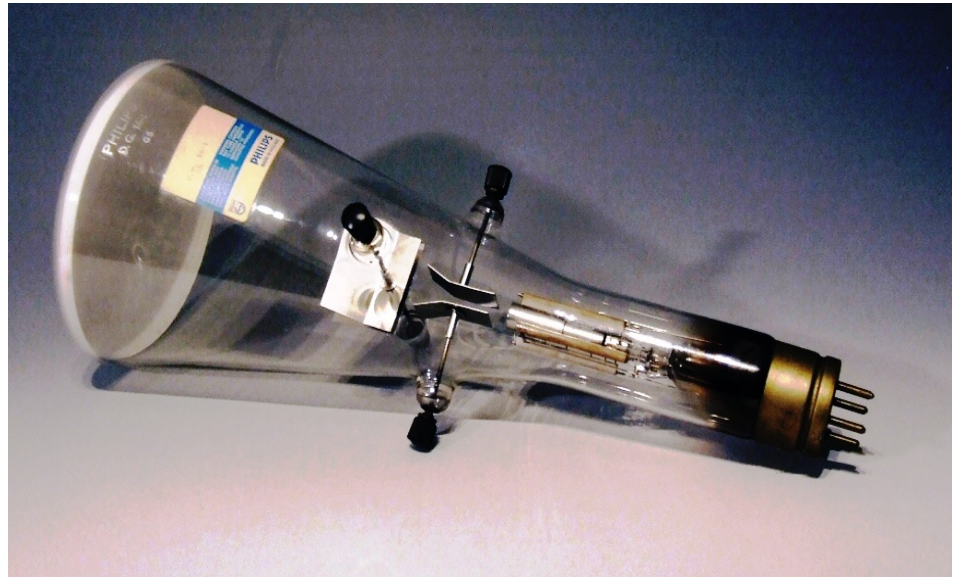
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along the horizontal time axis, and a second set of plates to move the beam vertically as it swept horizontally.

By the early 1920s cathode ray tubes, the same type being developed for video, were applied experimentally to laboratory measurements. The problem at the time was that they suffered from not maintaining their internal vacuum for very long, along with the poor stability of the cathode, the element in the tube that emitted the electron beam. Zworykin started working on a permanently sealed, high vacuum cathode ray tube with a thermionic emitter in the early 30s. But it took Dr. Allen B. Dumont, who started a company in his basement in 1931 to make that happen.

1930s CRT

Dumont Laboratories improved the average CRT life from 24 hours to over 1000 hours.



This made television, and derivatives like the scope, possible. The company managed to beat RCA to market by almost a year with an all-electronic TV receiver in 1938. Besides TV, by the 1940s Dumont was a leader in the field of test equipment with their scopes. The problem was that the company did not have the resources to go head to head with RCA and others in both the fledgling broadcasting industry and the electronic test market. Its lead in scopes slowly slipped and in 1960 Fairchild Camera and Instruments bought what was left of

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Network, and the television equipment divisions had been closed down. The Dumont brand of scopes were sold until the 80s.

The eventual leader, both in sales and technology, in scopes was founded in 1945 near Portland, OR. The company was named Tektronix and was founded by four people. Charles Howard Vollum graduated from Portland Reed College with a degree in physics. Although small and far from the Ivy League, the school has had over a hundred Fulbright Scholars, 67 Watson fellows, and three Winston Scholar alumni. After graduation he operated a radio repair business in the back of an appliance store owned by another Tektronix founder, Melvin Jack Murdoch. During the war Vollum was involved with the radar signal corps. Murdoch during World War II worked in the Coast Guard as an electronic technician. The other two were Miles Tipperly, and Glenn Leland.

Vollum was the president and Murdoch the vice president. The company started like another eventual large player in technology, Sony, which started about the same time an ocean away. Like the Sony founders, the Tektronix founders had no idea what they would sell, the four just wanted to manufacture, sell, and also repair electronic equipment. It was Vollum who decided that they would build an oscilloscope. It was designed using spare parts stockpiled by the partners during the war. The first one was as big as Vollum's workbench. Melvin brought in a Coast Guard machinist that he knew, to help reduce the size and this was completed in the spring of 46. It still weighed 50 pounds, but it functioned better than any other in existence. At the time Dumont was the largest producer of oscilloscopes. Vollum once said that all Dumont wanted to do was to fool round with big-time TV and they were complacent about their oscilloscope. By 1947 the company employed 12, and four years later had mushroomed to 250.

First Tektronix Scope

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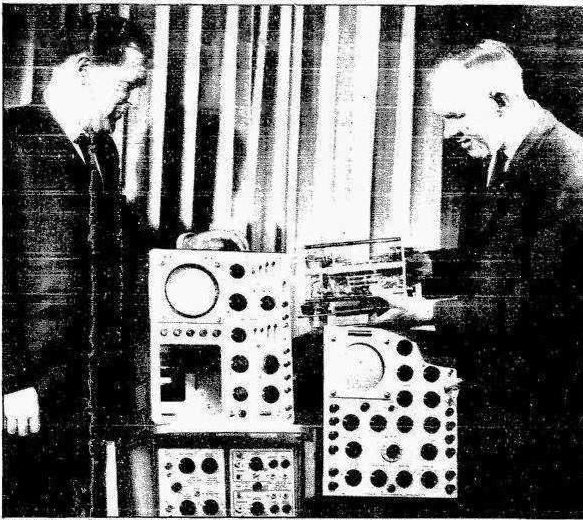
The first Tektronix oscilloscope, the company came to be known by customers as simply Tek, was the 511. In short time it was a success, bought by other major technological companies. By 1950 they had the 517, which was the seventh "generation" scope. In 1947 their sales were \$27,000. The next year it shot to \$250,000, and by 1950 it was

over \$1 million. At that time they had a backlog of orders almost a year long. Early customers were HP, Philco, RCA, Westinghouse, AT&T, and Bell labs. In 1948 they made their first overseas sale to L. M. Erickson which was a Swedish telephone company. By 1956 Tektronix was the scope king. A lot of their developments and inventions ended up in competitor's scopes, including the ones still offered by Dumont.

In the early 50s Murdoch started to lose interest in the company and took up flying, and even started an aircraft sales company on the side. At the companies beginning it was he who championed a "Tek" culture which centered on no perks for executives, and a family atmosphere with the use of first names, and that they should never have more than a few dozen employees. Although Tek paid lower wages, they offered better benefits and had profit-sharing. There were a few unbreakable rules. Employees were encouraged to follow their interests and at one time the company's culture was praised. The company took ideas from HP, whose founders Dave Packard and Bill Hewitt, developed what became known as "The HP Way." Similarly HP was a company that started with the goal of building electronic products, but "the question of what to manufacture was postponed." HP's original product was an audio oscillator, made much more stable by technical insights by the founders. An early customer was Disney.

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The HP startup case study, without revealing the company, in many MBA classes would be judged a formula for an abject failure. But in HP's case, it was not a product or its implementation that would turn into gold, it was the engineering culture they assembled from the beginning. HP encouraged its engineers to spend a part of their time on "skunk work" type activities that involved ideas that interested them. Often the founders would wonder the engineering caverns and stop by an engineer's workstation and bench, and look for some prototypical looking breadboard, box, or object and ask what that was about. The engineer would often attempt to convey how their developing idea would change the world or save mankind. Usually those efforts would not pan out, but once in every thousand or more stops, the idea for a new product would be hatched.



Howard Vollum (right) and Jack Murdock compare 540 series oscilloscope (left) with historic model at unveiling in 1964.

Vollum & Murdock

There is a strong compelling compulsion in engineering, as in other professions, that what I create might change the world. Even better if you work inside an

organization that covers the overhead and keeps you fed and warm. Many companies over the years started and got large with this philosophic concept. HP, Sony, Xerox to name a few current survivors. The larger a company gets, the more hubris sets in, and meeting quarterly earnings grinds down the grand goal of bettering humanity. Tek at the beginning burrowed the same concept that HP managed to keep far longer than most. Murdoch was originally Tek's "HP Way" cheerleader.

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Vollum was the driving force in the company when it came to basic engineering, and not the loftier philanthropic approach and outlook. He began the internal manufacturer of CRT's to get the quality that he wanted. He came up with plug-in modules for oscilloscopes in 1954, the model 530, which meant the scopes could be easily adapted for varied use. In 1955 one-half of all oscilloscope sales were the 530.

By the beginning of the 60s company sales were \$43 million, and by the end of that decade the company had 75% of the oscilloscope market. Their total sales in 1969 was \$148 million. When it came to scopes, they were beating HP by a large margin. HP at that time had a reputation for good, high end test equipment, that was slightly more designed in style and feel, and sometimes a little too much over-engineered. But Tek was the "working man's" provider of no-nonsense test equipment that got the job done at a price that management would pay. This was important because often, especially in the television industry, management wants to spend money only on what ends up affecting the product transmitted, and not the tools to maintain the technical integrity of the programming.

Soon the baggage that comes with getting large set in. In the early 60s Vollum convinced the Board of Directors to make Bob Davis the executive VP as Vollum was not equipped or inclined to give management the effort it needed. Davis had been in charge of manufacturing from 1954 to 1958 and he brought order to the operations. While reporting to Vollum, Davis ran the day to day operations. Davis was energetic and initially he was viewed as a positive step. But even by then there had developed an old guard that did not welcome change. They came to be known as the "old scope warriors." While there was significant growth under Davis and the companies first foreign subsidies started, the old guard prevailed. Already, the company was finding it difficult to branch into new areas of business. In 1962 Vollum was persuaded to retake control. A technology company that has problems innovating into new arenas often does not stay relev

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liked the outward buttoned down approach that Tek was following in the late 60s and it became an investors darling.

New campus

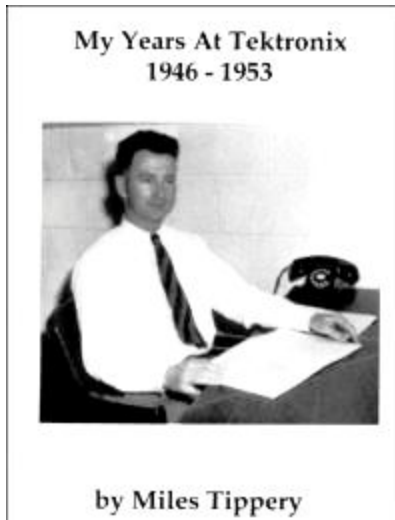
In the 60s the company built a new 300 acre complex in Beaverton, OR. In 1963 the company went public, and in the next year it



was listed on the New York Stock Exchange. Vollum told Forbes at the time that "there would always be an expanding need for scopes, because wherever electronics goes, the oscilloscope goes also." Over time though Wall Street changed its mind on the prospects of the company as it was not enamored with the fact that the company became so dependent on oscilloscopes. Computers were starting to be developed enough that they could mimic many of the testing duties that scopes did. More and more, not all electronics required access to an oscilloscope for design, testing, and troubleshooting. At this time, over 20 years after its founding, the company still did not have a lot of marketing experience since the oscilloscope up until then sold itself by being better and cheaper than the competition. Now the competition, even as the 60s ended, was coming from a new crop of companies, the computer manufactures.

Tektronix became a big player in television test equipment

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(Top)
The

waveform scope (video levels) (Bottom) The vector scope (color phase and saturation)

It ended up competing in adjacent markets to where the Group competed

No Longer Independent

Not that the scope business was going to disappear soon, after the 71 setback, growth continued. By the mid-70s Tek was actually Oregon's largest employer. Employee growth continued into the 80s to over 20,000. Earl Wheatland, who was executive VP at the time, was tasked with re-organizing the informational display group to concentrate on redesigning the terminals to reduce the cost. When it was re-introduced in 1971 the price was \$4000 instead of \$10,000. The marketing timing was better as computer aided design was emerging and the company's terminals were a perfect fit.



Earl Wantland (center)

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About this time Tek started looking to buy their way into diversification. Earl Wheatland, now company president, having replaced Vollum, in spring of 1973 called Donald Hare to talk merger. He proposed a stock swap between Tektronix and Grass Valley, with no money changing hands, making it eligible as a non-taxable exchange. Hare knew founder Paul Vollum well, and knew that Vollum had started the company with very little capital, just over \$10,000, and that he built a very good oscilloscope. Grass Valley seemed like a good fit. GVG sales the year before were \$4.7 million, with earnings of \$1.066 million. Total employment at the end of 1972 was 130. The acquisition was claimed to help strengthen Tektronix capabilities in the TV market.



TEK CORPORATE STRUCTURE was realigned last week as Group Vice President Bill Walker (left) was named Executive Vice President and Chief Operating Officer, and Group Vice President Larry Mayhew (right) was placed in charge of all of Tek's product and product marketing, consolidating T&M and IDG. President and Chief Executive Officer Earl Wheatland (center) will remain in his present position.

The officers of the Group held 52% of its stock. Thus, it was fairly certain that the necessary 2/3rds approval of the stockholders would occur. Soon the deal was settled. Wheatland said the Grass Valley acquisition would be a newly formed Tektronix subsidiary.

There were 500,000 shares of Grass Valley stock. On August 10, 1973, Grass Valley stockholders got one share of Tektronix stock for every 3.2 shares of Grass Valley stock they held. The closing price that day for Tektronix was \$40.375 on the NYSE, and \$10.50 for Grass Valley on the AMEX.

Not everyone was on board initially. A number of ABC engineers who were Grass Valley stockholders were not happy. They were worried that the Group would become just another division of Tek with new management, and that the

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called Tek regarding their concerns. La Verne Pointer, an engineering manager at ABC, said, "When we had an idea we'd call up or go out and see Bill Rorden. Bill would take out an envelope, ask some questions and make some notes. And we'd hear from him right away. Not weeks and months later. We didn't want to lose that." Tek in turn made early members of the group, Rorden, Cobler, and Sakai Vice Presidents of the Grass Valley subsidiary.

Tom Long, who was General Manager of the Tektronix Communications Division, became President and Chief Executive of Grass Valley while he continued his present duties in Beaverton. Thus the Grass Valley Group was a part of Tektronix Communications Division, which produced terminal and test equipment for the television industry.

The End of the Hare Era

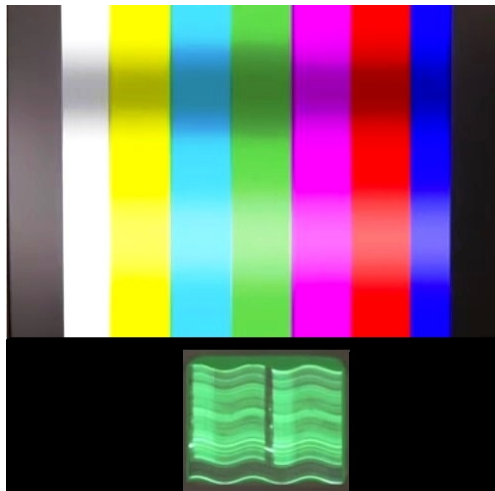
Hare had said when Grass Valley was an audio company, it had lots of competition, "sloppy" companies, making cheap stuff, and earning low margins. He found that the video industry had far more "stupidity" in that people would pay much higher prices than the audio folks. The Group could design video products for half the price but sell them at double the price of audio products. Bill Rorden once said that they discovered there was more ignorance in the video business than in the audio business, and the Group proceeded to take advantage of it.

Part of the Groups rise was that they often did not know early on what was the "conventional wisdom" that guided the entrenched. We already mentioned in the last chapter that when ABC was looking for another vendor of a piece of gear, a processing amplifier, or proc amp for short, Hare said "what the hell is a proc amp?" In short order they managed to produce one. We also already have told the story about RCA approaching the group to license an early product, and how Hare dismissed the RCA overture as pointless, since it would take RCA two years to move the copied GVG product through RCA's bureaucratic leviathan to final shipment. Hare said GVG would be two years farther a head of RCA then it was then. This was a

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they used modified TV receivers as video monitors. Yet, from a modest start they did some amazing feats of engineering.

A video signal, be it the analog kind they had back then, or even the digital signals we have today, is comprised of many parts, besides the part that is the actual video. There are other components in the signal that are for synchronizing the receiver to the received signal. A proc amp separates the different signal components and cleans them up and puts the signal all back together.



The effect of current loops on analog video as seen on a monitor and a waveform scope.

This problem, is caused by 60 Hz AC flowing through the shield of a coax cable. This is referred to as a "ground loop."

Since the sound manifestation when current flows through a audio cable is a "hum" sound, it is referred to as hum also when it happens in video.

Bill Rorden designed a "clamp" circuit for their proc amp which no one else yet had. That saved ABC at the 1964 convention. As the convention center had very bad ground loop problems. this is because different equipment had different power sources and grounds. Current "loops" would flow from one area to another through the coax shielding that carried the video. Those current loops would manifest themselves as light and dark bars that would roll up through the video. A clamp circuit would insure, once per horizontal line that this rolling banding was removed. This feature that essentially cleaned up the sync, was called Ajax, not named for the cleanser though as many thought. No Hare named it after a Greek mythological hero and a warrior

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Analog video signals were complex for their time, and the synchronizing signals in it took quite a bit of electronics to produce. This was before complex ICs could be put into every individual piece of gear. So the required sync signals were generated by a dedicated device and sent to all the gear requiring those signals. Often, even in the 60s, there were six of those signals that were required to be fed to various gear. To save cable a lot of equipment was designed to not require all the signals. So many of the signals were not complete, as they were missing some synchronization pulses which would be added later, often by the video switcher. These were known as non-composite signals. Not to be confused with composite/component terminology that came later.

ABC asked Rorden if they could design their proc amps and DAs to recognize the difference between the two and to clamp the non-composite signals that did not have the sync pulses. He thought about it for a while and thought that since he could see the difference on a scope he should be able to come up with a way to have electronics recognize the difference and act on it. Some at ABC said it could not be done. The fix was called Apollo. The Greek god of wisdom.

But things change, and the sale to Tektronix brought change. Aside from the written merger agreement Hare was asked to stay on for two years as a manager while the new management sent down from the parent observed and gradually assumed control. Dr. Hare quickly found himself moving from the center of all things Grass Valley, and soon found himself wearing a consultant's hat, but increasingly he was an advisor whose advice was not wanted by the new overlords. Hare was given one description of his role in management and the overseers sent from Tek were given a conflicting view of what they expected from him. That situation did not last long, and Hare stopped physically showing up.

The Hare's on the Colorado River

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It soon became clear that Hare did not fit into Tek's long term plans, so he retired

While tactical operations continued under the Grass Valley VPs, increasingly, the strategic vision was in the hands of Tek veterans.

Hazel and Donald took up flying, and became familiar with the Phoenix area, settling there. They found a residence on the side of Mummy Mountain in Paradise Valley that had their three essentials; a safe place for their dogs, a large area for a workshop and laboratory, and a room that could be converted to a climate-controlled wine cellar. Tektronix allowed Hare to take his entire research bay, including the instruments, which Tek moved to Arizona along with their furniture and their wine collection. To stay busy they took up computer programming lessons at the local college, and Spanish lessons from a private tutor. They also traveled. One trip was a twenty-day boat trip down the Colorado River through the Grand Canyon. When Hare learned they were limited to a certain amount of luggage he carefully measured out twenty days worth of his daily ration of J & B scotch.

Some of the Hare's activities were slowed temporarily by surgery to replace a section of Dr. Hare's aorta, which had developed aneurysms. When recovered they flew the Concorde to Europe and spent time in Spain testing their Spanish proficiency. Always looking to improve upon what he found he thought there was not a good textbook on Spanish grammar, and thus set out to write one.

He became an ardent backer of Hillsdale College in Hillsdale, Michigan, and the college's battle against government interference in the school. Hare eventually developed

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by changing the frequencies of selected sounds to make them more understandable rather than just amplifying all sounds.

His entrepreneur spirit never left, and he looked for promising startups to financially guide and support. He looked into redesigning golf clubs with a pro-golfer. He had the author of his autobiography, "The Inscrutable Dr Hare," Bob Robertson, search for promising engineers who wanted to start their own company. While they found some promising candidates, like the golf club idea, deals were never finalized over disagreement over the future control of the proposed startups.

Hare stayed active until his passing on Christmas Day, 1984. Dr. Hare died while sitting at his computer. He was 77. That was the same year that the Group celebrated its Silver Anniversary.

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