Fascination with cathode-ray tubes leads to book by Tektronix engineer

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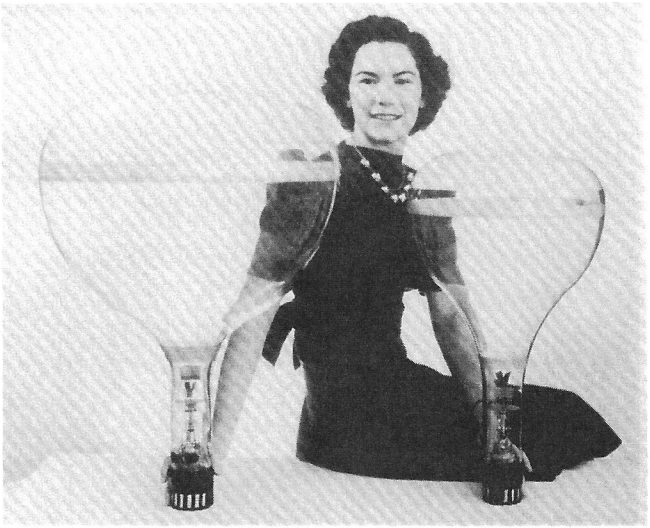

This is one of Pete Keller's favorite photographs in his book because of the "beautiful pieces of glass" in the Du Mont 14- and 20-inch electrostatic deflection CRTs, from about 1940. The photo is from the Allen B. Du Mont Collection, National Museum of American History, Smithsonian Institution. Pete copied the original print while doing research at the Smithsonian.

Since the time he built an oscilloscope for a junior high school science fair project, Peter Keller, Engineer with T&M's Radiometric Instruments, has had a special fascination with cathode-ray tubes (CRTs). So it's no surprise to his friends that he is the author of a just published book on CRTs, *The Cathode-Ray Tube: Technology, History, and Applications* (Palisades Press, 1992).

There's something about the exotically shaped glass tubes that grab his attention. Part of the attraction has to do with the engineering elegance of CRTs, which utilize an invisible, inertia-less beam of electrons for complex image display. Another factor may be the amazing flexibilty of CRTs — we see them everywhere today, serving a wide variety of image display needs, from PC monitors to television sets to avionics instruments. This ubiquity could hardly have been imagined when the first practical CRT was developed in 1897.

"The funny thing is," Pete says, "everywhere you go you see CRTs — in the office, at home, at the bank, in grocery stores, in airplanes — but few people know how they work. I find myself often explaining the fundamentals of CRTs to customers and even to other Tek engineers. And I noticed that there was very little literature on the subject."

Instrument designers looking for advice on what characteristics to look for in a CRT that would help them optimize the performance of their products just don't have many sources of information. That's one of the reasons Pete decided to write the book. Another reason was that many of the old-timers in the business were retiring, taking their experience and knowledge of CRTs with them.

Sadly, he says, much important historical information is being lost as companies dispose of old files. Pete had been thinking for some time of writing a book on CRTs and had even talked about it with his fellow members at the Society for Information Displays. (He's chairman of the society's Committee on Definitions and Standards.) Then, while visiting a transportation museum in Nuremberg, Germany, he came across a CRT designed in the early 1930s by Manfred von Ardenne, who investigated the use of gas-focused CRTs for television, developed high-vacuum CRTs, and later made important contributions to USSR's nuclear program. "It was the trip to Nuremberg that triggered me into action," says Pete.

The CRT remained essentially a laboratory curiosity until World War II, when millions were manufactured for use with radar equipment.

The book includes an in-depth, type-by-type look at CRTs designed especially for radar, TV, information display, and oscilloscopes. The book includes more than 100 rare photographs and many old drawings, including photos of a number of Tektronix-built CRTs.

(The 320-page hard-bound book is available to Tektronix employees at a 15% new publication discount for $59 until November 30, from Palisades Press, 201 Varick Street, Suite 1140, NY, NY 10014.)

Pete took about five years to research and write the book, working evenings, on weekends, and on vacations. He and his wife, Irene, traveled the country visiting museums, corporations, and government installations. For six months, the Kellers' dining room was off limits, converted to a photographic studio so that they could take pictures of hundreds of CRTs made available to him by his industry contacts and collectors of electrical equipment. He spent days searching through the Smithsonian Institution's archives, thanks to the help of Elliot Sivowitch, the Smithsonian's expert on electrical history.

Pete Keller

The Smithsonian collection is especially significant because it includes many CRTs and files from Du Mont Laboratories. "I found myself especially drawn to Allen B. Du Mont and all that he did," says Pete. "He was an entrepreneur and an accomplished engineer." In 1931, Du Mont left the De Forest Radio Company, where he was chief engineer, to start his own company, the Allen B. Du Mont Laboratories. Beginnning by working out of his basement, he developed commercially viable cathode ray tubes for television and oscillography. Until the early 1960s, Du Mont manufactured an extensive line of CRT oscillographs. He was convinced electrostatic CRTs would make the best TVs. Some of these tubes were gigantic, almost 28 inches in length. Du Mont began manufacturing commercial TV receivers in 1937, marketed some of the first postwar TVs, and founded his own TV network.

Pete's friends at the Smithsonian also put him in touch with Dr. Tom Goldsmith, who had worked at Du Mont as director of research and had donated many old Du Mont files to the Smithsonian and to a handful of universities. Goldsmith was at Du Mont Television Network when it was purchased by Paramount Studios in a defensive move by Paramount, which was feeling the effects of competition from television. When Paramount took over, Goldsmith was ordered to destroy all kinescope recordings of Du Mont programs, including many Jackie Gleason shows.

The first practical CRT was developed in Germany by Karl Braun. He was the first person to combine all of the parts of the modern CRT — electron beam source, acceleration electrodes, focusing section, deflection system, phosphor screen, and envelope — into one device. Braun's tube was developed to measure voltage, current, and phase for AC power generating plants that were beginning to be built in the latè 19th century.

The CRT remained essentially a laboratory curiosity until World War II, when millions were manufactured for use with radar equipment. *(Tektronix-to-be-co-founder Howard Vollum, for*

Cathode-ray tubes were the cornerstone of Tektronix products, and they are still essential in a wide range of our products, from oscilloscopes to X-terminals. The importance of CRTs to Tektronix is illustrated in this reproduction of an early catalog. The original Tektronix logo, used on the cover, included a CRT.

example, built his first oscilloscope while a student at Reed College in the mid-1930's, and then worked on radar improvements for the British and U.S. military during the war.) Then, with the explosive growth of the television industry following the end of the war, CRTs in the form of TV sets became household fixtures.

There are two basic types of CRTs: electromagnetically deflected CRTs, used almost univerally for TVs, computer displays, and radar applications; and electrostatically deflected CRTs, used primarily for oscilloscopes where extreme speed is required to position

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the electron beam to a desired location on the screen to follow rapidly changing waveforms.

Despite competition from other display technologies and predictions of obsolescence for years, CRTs continue to proliferate, Pete says.

Raised in Pleasantville, New York, Pete is a 28-year Tektronix veteran. Many know him as "Mr. J-16" for his years of work helping design and then market the venerable J-16 Tektronix photometer.

The J-16 enjoyed a 20-year product life cycle, and Pete has just introduced its successor product, the J-17, with which he has had engineering and customer application assistance. The J16 and the J17 are widely used for display measurements, both CRT and flat panel. The J17 (with its microprocessor control, ability to measure color as well as light intensity, RS-232 output and small hand-held package) is being well-received by customers and paves the way for follow-up products. The trend toward flat panel displays and high-definition TV makes the J17 a timely addition to the Tektronix product line.

Pete has had a varied and colorful career, working in the electronics industry all his adult life. His first job was with General Precision Labs in New York, where he built, tested, and refined prototypes of electronic equipment. Then he found himself in New Mexico, running a meteor tracking project for Stanford University. When that project ended, he opted for a position with GeoScience, the company that had provided Stanford with its New Mexico facilities. His work at GeoScience involved upper-atmosphere studies and the tracking of Soviet rocket launches and satellites (these were the early days of the Soviet space program).

Many of Pete's early work assignments involved the use of CRTs and he became an expert in their use. While in Arizona, he befriended a Tektronix sales engineer who encouraged him to apply for a job at Tek. Keller was familiar with Tek instruments and his aversion to leaving the Southwest was overcome by his interest in CRTs. Tek hired Pete in 1963, ostensibly to work on CRTs, but his experience in upper-atmosphere observations, which had made him familiar with techniques of measuring light, led in a little different direction. Many of his early years at Tek were spent working on new light measurement techniques and systems for Tek instruments. This was very rewarding work for Pete and, of course, most of it involved the use of CRTs. Eventually, Pete moved into high resolution display engineering and that is when he first got the idea of writing his book.

So what's next for Pete? His publisher has suggested a book on measurements of information displays, an area that is in need of a comprehensive textbook. "Frankly, I'm intrigued by the idea," Pete says. "Although it is a lot of work — more than people can imagine — the process of writing a book is very energizing. On the other hand, Irene likes having our dining room back. And when I mentioned the possibility to my daughter, she threatened to disown me. So I'm still thinking it over."

—By Mike Miller