# The Autogram Display and How It Reduced the Logic Design Cycle
by Jim Andrews

Earl Vraa, Defense Systems Division (DSD) Engineering, attended an Automated Design (AD) conference in 1964 where he met a fellow "AD'er" from IBM. They talked about the logic drawing generation challenge. "Wouldn't it be great if we could generate them on a Cathode Ray Tube (CRT) and capture them on film?" Earl came back home and talked to display engineer Lee Granberg about it. "No problem", said Lee!!! "All we gotta do is find some company who can fine grind the phosphor and deposit it in the cathode ray tube. And then we need to find a 35MM camera capable of recording the screen image".

Lee went to work on the design of an electronic unit that became known as the "Autogram" display. The unit featured a 5" CRT capable of 3,000 lines per inch in a tabletop box. Incidentally, that CRT cost **$2,400** (1964 dollars) but well worth it with resulting cost savings. A 35mm camera was mounted in front of the tube. Under the side panels were two wings of small circuit cards which held the logic to control the beam to draw lines and generate alphanumeric characters on the tube. It also had logic to draw the "bullet" and "shield" symbols that represented the "And" and "Or" gates used by logic designers of the day. The camera, mounted in front of the tube, operated with the shutter open to capture a drawing, line by line, character by character, and symbol by symbol until it received a signal from the box to close the shutter and advance the film when the drawing was complete.

In 1969, Earl introduced me to the Autogram display and asked me to make it operational with our Logic Diagram software that was producing inked drawings on the Cal-Comp drum plotter. Not having any hardware or photography experience, I teamed with electronic technician Bob Helmueller to work the task. The Autogram was kept in the highly classified Plant 2, Building 6 facility. Even with my secret clearance, I had to be escorted by Bob any time I was working on the unit.

This included standing with him in the small closet that served as a darkroom as he developed the film.
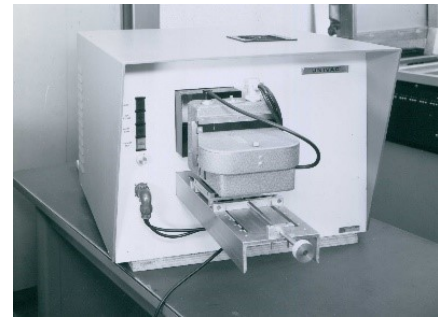
Bob was responsible to tweak the logic cards for optimal performance and focus the camera for good pictures. I was responsible for the software needed to interface it with the Logic Diagram System (LDS). Using the Cal-Comp Plotter subroutines framework as a template, I created similar Autogram subroutines and put an option in LDS to choose the output device, Cal-Comp or Autogram and produce a magnetic tape to drive the device.

Early trials revealed that the hardware character generator and the logic symbol generator in the Autogram were inadequate. It was decided to bypass them, and vector generate all symbols and alphanumeric characters. A vector generated character set was created with software and once implemented, the logic drawings produced on the Autogram were usable as working mil-standard drawings. Drawings that took 20-30 minutes on a Cal-Comp took less than 20 seconds on the Autogram. Each drawing was on a 35mm slide from which a hard copy print was made.

In 1971, the Univac 1110 computer development was being done at plant 4 in Roseville, MN using their Commercial Logic Diagram program and two Cal-Comp plotters to produce their logic drawings. Cal-Comp Plotters were slow and were impacting the program progress. It was determined that it would take the two plotters 27 days working 24 hours a day without problems to produce a complete set of 1110 logic diagrams. Management asked if I would go to Roseville plant 4 and interface their commercial logic diagram program with our Autogram output routines. These changes permitted a complete set of drawings to be produced overnight. For my efforts, I was awarded the corporate wide Sperry Excellence Award.

The success of the Autogram display led DSD to design and build the 1617 COM unit and the CAMIDS Software and publications language which was the Microsoft Word of its day. These were used for several years to produce publications, manuals, papers, or anything that previously was done on a typewriter before Microsoft Word was released. Dr. Kenneth Thurber, a Sperry Univac employee, and a member of the Computer Science Department at the University of Minnesota, produced the first textbook "Large Scale Computer Architecture" using CAMIDS on the 1617 COM.
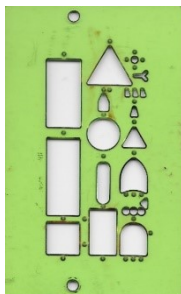
By 1974, the Autogram display was no longer needed by DSD. The 1617 Com had taken over the production of working logic drawings and the Autogram was collecting dust from lack of use. But not for long! The company folks in Salt Lake City (a commercial site) had a need for a low-cost microfilm capability to speed up their working drawing production and inquired about the Autogram. The hardware was shipped to them, and I built them a special LDS that produced diagrams according to commercial standards. The primary difference was that DSD diagrams flowed top to bottom while commercial diagrams flowed bottom to top. I never saw the Autogram display again and wonder if it still exists. It would be a great addition for display at the Lawshe Museum. {Editor's note: the auto gram is on the table at the left, photo from the Lawshe Memorial Museum archives.}

Author: Jim Andrews, 1967 (UNIVAC) – 2010 (Lockheed Martin), started his 43-year career with Univac in the Automated Design department. Over the next 18 years, he wrote programs to aid the design, development and documentation of next generation Navy and Air Force computers. He followed with 2-years in Human Resources, teaching management development courses, improving the MAPPER training enrollment and record keeping system, and helping staff to overcome their fears in order to make productive use of the computer. After HR, he worked on the Canadian Patrol Frigate project and then spent a few years in the Information Technology (IT) group as liaison between Engineering and IT. He finished his career as a Systems Engineer in the Subsurface Q-70 group which developed computer and display systems for use on submarines. Jim is now a VIP Club Director and the webmaster.

{Editor's notes: The bottom right of this 'drafting template' is the AND gate referred to in the 2nd paragraph of the first page (bullet.) Above it is the OR gate (shield.) Before CAD was developed; engineers, technicians, and draftsmen had to manually draw each logic gate and the gate interconnections. Reference http://vipclubmn.org/Engineering.html#CAD for more about Legacy CAD.} *LABenson*.