Tektronix stores graphics in the tube

Four years ago, when the Tektronix Type 564 storage oscilloscope was introduced, researchers working with time-shared computers quickly saw its potential as an operator-oriented computer graphics display.

Two years ago, the company's newly appointed director of research and production, C. Norman Winningstad, took aim at the computer-peripheral market. Tektronix worked with the Massachusetts Institute of Technology's Project MAC (Multi-access Computer), and lent an early version of its storage cathode-ray tube to MIT researchers for evaluation.

This crt retains the image of an electrical event after the event. As in conventional crt's a gun scribes the input signal on the tube's fluorescent screen with an electron beam. A second gun sprays the screen with slow-moving electrons, holding the written areas bright and the unwritten areas dark. This characteristic—bright trace on dark background—is called bistability.

Erasing. The screen is erased by writing the whole screen bright with a positive pulse, then dark with a negative pulse.

Tektronix modified its earlier storage crt, added circuits, and packaged two storage-display units. It shipped a production model of its new Type 611 storage-display unit to Project MAC, and lent another to the University of California at Santa Barbara, where time-shared computer work is also under way. Evaluation quantities are available, says Tektronix, for delivery in 90 days.

No memory. The Type 611, has an $8\frac{3}{2}$-by-$6\frac{7}{8}$-inch display area. The bistable crt in the unit eliminates the memory usually needed to refresh the image, a modification that probably will reduce the 611's cost as well as the fees for use of data-transmission lines from remote computers to the display terminal.

The MIT engineers are still hoping for an 11-by-11-inch storage crt, but will build a prototype terminal around the Tektronix unit [Electronics, June 27, 1966, p. 48]. The full terminal is scheduled for initial tests in December. MIT will build about 10 and then try to interest some company in manufacturing them under a license.

Unlike crt's that must be refreshed frequently to prevent flicker, the bistable tube's image is constant and retains the selected operating mode. It requires 0.5 second to erase a stored image.

The 611 flat-faced tube is electromagnetically deflected to preserve small spot size, a method that usually gives rise to such problems as nonlinearity, and pincushion and barrel distortion. Although they won't say how, Tektronix claims it found the right answers.

A write-through feature enables the operator to position the writing beam to any point on the crt screen without storing the new trace or erasing any previously stored traces.

Resolution of the 611 is 500 stored line pairs vertical, 400 stored line pairs horizontal. Dot writing time is 20 microseconds.

The erase, nonstore, write-through, and view modes are remotely programable through contacts on the rear panel. Switches on the front panel provide manual control of erase and view functions.

The long view. Maximum recommended viewing time is 15 minutes, but images can be held under conditions of reduced brightness for about an hour. If held longer than that, some traces will remain.

The 611 sells for $2,500, its smaller companion, the 601, for $1,050. But neither stands alone as a display terminal. A workable graphic system would require at least a character generator, a keyboard, and a communications-line interface, so that a system using the 611 would cost about $7,000 with hardware.

Textronix Inc., P. O. Box 500, Beaverton, Ore. 97005. **[338]**

Displaymates. Tektronix Type 601 storage display unit, left, retains nonfading alphanumeric and graphic information on 3.2-by-4 inch screen. Type 611 has a 6.5-by-8 inch screen, offers write-through traces than can be viewed without being stored and without disturbing previous graphics.