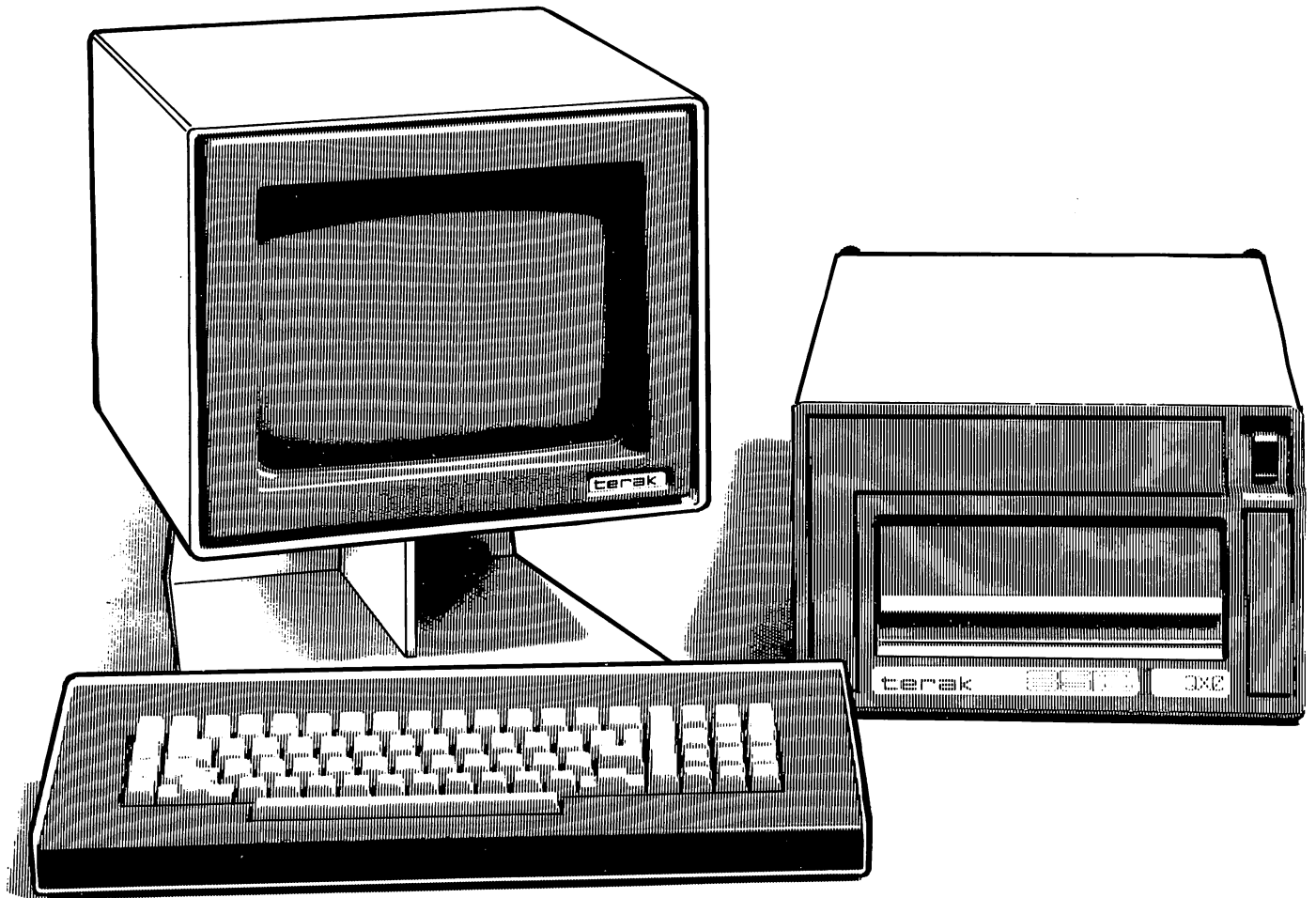


# PRODUCT DESCRIPTION

## terak 8510/a GRAPHICS COMPUTER SYSTEM



terak  
CORPORATION

# THE SYSTEM

The 8510/a GRAPHICS COMPUTER SYSTEM consists of the Model 8510 DATA PROCESSOR, with FIS/EIS (Hardware floating point option) a 56K Byte memory/video controller unit and the Model 8532 Keyboard/Display. This special configuration provides the user with a flexible disc based digital computer system, programmable through a variety of standard languages, with the added capabilities of producing medium resolution raster scan graphics. User programs can display both characters and graphics, independently or simultaneously in any combination of three zones in the display area. The character dot pattern is alterable through program control of a writeable character generator (192 character set capability) facilitating any special character representation desired including foreign language character sets.

- FEATURES:**
- LSI - Processor (16-bit word)
  - Power Monitor - power fail/restart
  - Auto Bootstrap Program Loader
  - Flexible Disk Mass Storage (IBM 3740 format)
  - Single Serial Interface
  - 28K 16-bit dynamic MOS memory
  - 12" CRT display
  - Full ASCII keyboard
  - 320 dot wide x 240 dot high graphics display
  - Alterable character generator
  - 2-port memory structure
  - Simultaneous character/graphics displays
  - Full disk operating system support
  - Supports BASIC, FORTRAN IV, APL, PASCAL



## THE 8510 DATA PROCESSOR

The TERAK 8510 is a completely self-contained disk based computer system incorporating a powerful LSI technology processor, a single flexible disk drive, a disk controller which handles up to four drives, single serial interface circuitry, power supplies and 4K words (16-bit) of MOS read/write memory.

The system is further enhanced by the unique TERAK universal serial interface panel allowing use of any peripheral requiring 20ma or RS-232-C signal levels and any of 14 switch selectable baud rates.

The 8510 features a 16-bit CPU, word and byte processing, eight general purpose registers, hardware and software interrupts, real time clock, parallel I/O data bus, power failure/auto-restart logic and hardware multiply, divide and floating point arithmetic.

The 8510 is supported by a complete disk operating system including a single job and a foreground/background (F/B) monitor. The operating system supports a MACRO Assembler, Editor, Linker, Librarian, file transfer software and utilities for converting, dumping, comparing and

verifying. The operating system also supports three high level languages; BASIC (single and multiple user) FORTRAN IV, and APL. The 8510 also supports a version of the PASCAL language. (Software is separately priced.)

The 8510 is housed in an attractively painted sheet metal cabinet measuring approximately 7.5"H x 12"W x 18"D. The entire unit weighs less than forty pounds (40 lbs.) and consumes about 150 watts.

## THE VIDEO DISPLAY CONTROLLER AND 24K MEMORY SYSTEM

The display and memory system provides the 8510/a with main memory and with an extensive display capability. This system is contained on a single 8-1/2" x 10" PWB. Output from the display drives the 8532 keyboard/display using a raster scan dot matrix. Programs can display both graphics and characters, from independent buffers. In addition, the dot pattern displayed for any valid character code may be changed by program control of the alterable character generator. Features of this system include:

- 24K memory. Combined with the 4K word memory on the 8510/a processor, a total of 28K 16-bit words is provided.
- 320 dot wide by 240 dot high graphics display. An aspect ratio of .75 maintains a "comfortable" viewing area.
- Square dot matrix graphic display. Horizontal and vertical dot spacing are equal, eliminating any need for scaling correction.
- Main memory graphic display buffer. The graphic display is refreshed from the main memory. The buffer start address is under program control, accommodating variable boundaries between programs and buffers, simplifying addressing, and allowing rapid switch between dual buffers.
- Zone blanking of the graphic and character display.
- 2-port memory structure. Graphic display refresh does not use the 8510/a central data bus.
- 24 x 80 character display. Characters can be displayed simultaneously with graphics.

- 8 dot wide by 10 dot high adjacent character blocks. Accommodates 5 x 7 characters with lower case descenders.
- Page buffer independent of main memory buffer is both read and write, facilitating editing the character display.
- 192 character code set capability. Full 8 bit byte is used.
- Writable character generator. Foreign languages, APL, and "primitive graphics" (e.g. histograms or forms) are easily supported under program control.

## MEMORY

The memory display system provides 24K words of 16-bit dynamic Read-Write memory. The memory cycles at full bus speed when the graphics display is blanked, and is functionally independent of the video controller. (4K words are resident on the LSI processor board providing the 8510/a with 28K words total.)

## VIDEO CONTROLLER

The video controller is designed to provide medium resolution graphics and random-addressed character displays on the 8532 Keyboard/Display. Both displays are refreshed at 60 frames per second. The 24K memory is structured in a two-port design, allowing access by both the processor and video controller. This allows essentially full processor speed while the displays are being refreshed. The character display is refreshed simultaneously with the graphic display. Otherwise, the graphic display and character display are independent.

The graphic display is presented on the video monitor as a matrix of dots, 320 wide by 240 high. This area is presented with an aspect ratio of .75 such that there is equal spacing between any two adjacent dot positions. This "square array" minimizes the computation requirements for accurate placement of graphics. When active, the graphic display illuminates or blanks each dot according to the contents of a buffer in the memory. Maximum memory requirements are 4800 words for this buffer. This can be reduced, with simultaneous reduction of the area of the monitor displayed, by the selective blanking feature.

The character display is presented on the video monitor as a 640 wide by 240 high matrix of dot positions. The horizontal dot spacing is one-half the vertical. Alternate horizontal dot positions are coincident with the graphics display matrix, such that the same area is displayed. Each character is displayed within an 8 dot wide by 10 dot high block, allowing display of a total of 1920 characters simultaneously with the graphic display. Each character position is illuminated according to the contents of the page buffer, and the contents of the character generator memory. The page buffer is a random addressable 2K byte, read-write memory independent of main memory.

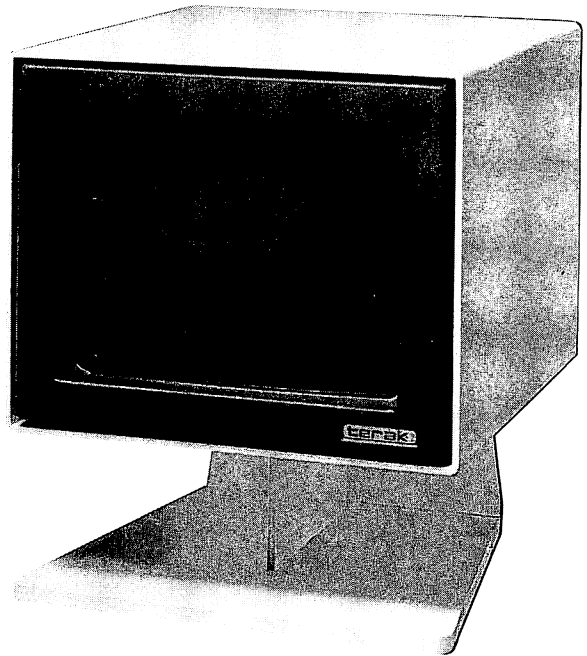
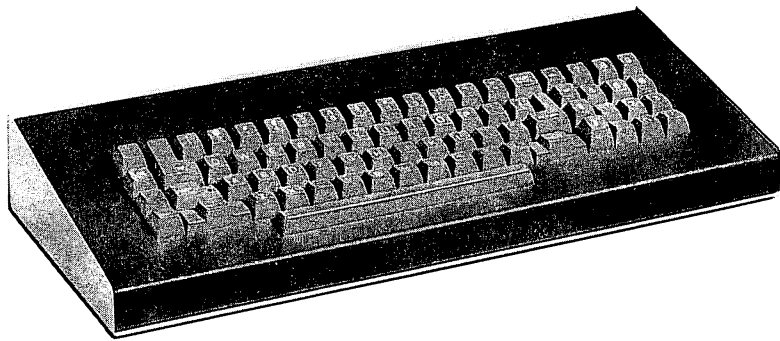
Both the graphic display and character display can be selectively blanked. For blanking control, the display matrix is divided into three horizontal zones: 80 lines by 320 dots each for the graphic display, or 8 rows of 80 characters blocks each for the character display. Each zone may be selectively blanked or displayed. Blanking of any one character display zone is mutually independent of the blanking of any one graphic display zone. When a graphic display zone is blanked, the corresponding area of the graphic display buffer in main memory is not read during refresh, thus reducing buffer storage size and reducing processor thruput degradation. If all zones of the graphic display buffer are blanked, no processor thruput degradation will occur, since no graphic refresh occurs.

The character display page buffer is structured in a two-port manner, similar to that of the graphic display, thus allowing simultaneous refresh of graphics and character displays. This is possible since the page buffer is completely independent from the main memory. Each byte of the page buffer is mapped onto the video monitor to one of the 1920 character blocks. Each byte is translated into an 8 by 10 dot matrix by the character generator. The character generator is controlled by the generator buffer, which is separate from main memory and the page buffer. It holds 192 blocks of dot patterns, corresponding to 192 valid 8 bit codes. The contents of the character generator buffer are established by the operating system or the user before characters can be displayed. Any special characters or character sets can be used by writing patterns into the generator buffer.

The generator buffer is both read and write memory, allowing easy generation of video reverse and modified characters. Since the page buffer is also both read and write memory, it can be used for direct storage of the text under attention, without need for a second image in main memory.

## PROCESSOR SPECIFICATIONS

Processor . . . . .	DEC LSI-11 Microcomputer 16-bit word Direct Memory Access (DMA) Real Time Clock Interrupt Variable Word Operand Length 1, 2 or 3 Word Instruction Length Hardware Floating Point 8 Addressing Modes 8 General Purpose Registers	Mass Memory . . . . .	Single integral flexible disk drive. IBM 3740 compatible format, ceramic read/write head, 320 ms average access time. 256, 256 bytes per diskette. Reliability: Read error rate — less than 1 in 10 <sup>9</sup> bits Unrecoverable read error rate — less than 1 in 10 <sup>12</sup> bits Head Life — 15,000 Contact Hours Media Life — Greater than 10 × 10 <sup>6</sup> passes per track on approved media.	Environmental . . . . .	Operating Temperature — +40°F to +90°F Operating Humidity — 20% to 80% R.H. (non-condensing)
Primary Memory . . . . .	Dynamic MOS RAM; 56K Bytes, standard			Physical . . . . .	Height 7.5 in. (19.0 cm) Width 12.2 in. (31.0 cm) Depth 18.0 in. (46.0 cm) Weight 40 lbs. (18.2 kg)
Terminal Interface . . . . .	Asynchronous EIA RS-232-C and 20ma current loop (active/passive). External switch selectable baud rates (14) from 50 to 19,200 baud.	A.C. Power Requirements . . . . .	120 VAC @ 60 Hz 150 watts typical	Standard Options Available . . . . .	Additional single serial interface Line printer controller 16-bit parallel interface



## THE 8532 KEYBOARD/DISPLAY

The TERA 8532 incorporates a video display (CRT) with a 12" (diagonal) screen, and a free-standing keyboard providing a full 128-character ASCII set and function keys for Cursor Control (right, left, up, down), Space, Carriage Return, Escape and Delete. Automatic time delay repeat of all keys is standard.

The 8532 utilizes a P4 phosphor at a refresh rate of 60 times per second.

The video display unit houses an audio alarm (2" speaker) which can be operated in two modes — standard 700 Hz continuous tone or, under software control, variable tones employing pulse width or pulse position techniques.

The Keyboard and Display units are individually cable connected to the Processor unit permitting maximum

flexibility in positioning of units for operator convenience. The Processor is equipped with a standard BNC connector providing composite video output for remote monitor viewing.

The keyboard and display unit are housed in separate cabinets, the display unit cabinet containing all associated power supplies. The video display unit cabinet measures approximately 10.5"H x 13.0"W x 12.0"D and the keyboard housing measures approximately 3.5"H x 16.0"W x 6.5"D. The combined units weigh approximately forty (40) pounds.

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### GENERAL

The 8510/a GRAPHICS COMPUTER SYSTEM operates on American National Standard single-phase, 120 volt 60Hz line power per ANSI C84.1-1970. The complete system has been designed in a totally modular fashion to facilitate any required maintenance. TERA warrants the 8510/a system to be free from defects in material and workmanship for one year from date of installation in accordance with its published warranty policies.

The 8510/a system runs under RT-11/85A. This operating system is the DIGITAL EQUIPMENT CORPORATION (DEC) RT-11 Operating System with a modified boot handler and loader. TERA is authorized to license third party users to acquire software binaries for use on a single CPU (8510). A version of the PASCAL language is also available for the 8510/a. All software is separately priced.

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**terak**  
CORPORATION

14405 NORTH SCOTTSDALE ROAD  
SCOTTSDALE, ARIZONA 85254  
(602) 991-1580