OVERVIEW

The Whizzard 1600s are compact, desktop graphics design terminals. The display package combines powerful, interactive graphics with minimal host interaction and full-function alphanumeric capabilities.

The 1600s desktop design makes them ideally suited for most environments. Ergonomic features, such as a detachable keyboard and CRT tilt and swivel, increase user comfort.

The 1650 color unit with a standard 19" tilt and swivel monitor provides 640 x 480 pixel screen resolution. Its local memory stores data at 4096 x 4096 resolution. Standard 1650 graphic capabilities include polygon fill, clip, pick and local transformations such as translate, real zoom (scale) and rotate. Up to 16 colors from a possible 4096 may be simultaneously displayed.

The 1645 provides the same display capabilities as the 1650 but without color or blinking. With a standard 19" monitor, it also offers a greater screen resolution of 1280 x 960.

The 1600 family's power and functionality make these design terminals suitable for a wide variety of applications from computer-aided design, training and simulation to data analysis and process control. Distributing data processing among multiple microprocessors and high speed discrete circuitry provides high performance graphics and all normal alpha terminal functions.

An 8086 processes vector data held locally in display list memory. Megatek's own high-speed, bipolar circuitry converts it to pixel data for the 1650's raster color display. A dedicated 8085 microprocessor provides interaction with the keyboard, joystick and valuator dials.

In alpha-terminal mode, Whizzard 1600s are ANSI, VT100 and VT52 compatible. Their graphics and alpha capabilities eliminate the need for a separate alpha terminal in a graphics system.

371600
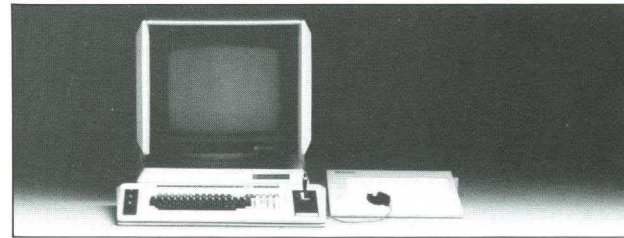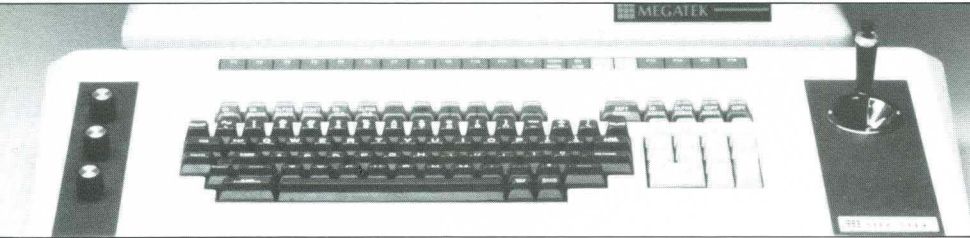
Whizzard 1600s incorporate a high degree of local functionality, reducing the burden on the host computer and communications interface. As a result, system response is maximized and programming simplified.

LOCAL INTELLIGENCE
Display List Memory

Graphics data and commands are locally held in a specialized memory configuration known as the display list. The 1600s are configured with 128K bytes standard—or 256K bytes optional—local display list memory. This dedicated local memory holds vector data that can be displayed and transformed efficiently without the host computer once the Whizzard has received the rotate, scale and translation commands.

Megatek's I/O protocol defines 98 commands and attributes that can be loaded into the display list. A display list is made up of user-defined segments and subroutines which provide logical groupings of graphics entities. Each segment contains a header and graphics information. The header holds status information, such as visibility, detectability, line style, etc., which relates to the graphics data contained within the segment. Segment graphics data may be simple, as for a single vector, or complex, for an entire entity, depending on user requirements.

The 1600 instruction set provides 12 bits to define X and Y coordinates for full 4096 x 4096 virtual space addressing and offers high resolution and true scaling, instead of pixel replication. The 1600s also support subroutine nesting to 64 levels, which gives the most efficient memory management and performance of any system in the 1600 price range.

Direct Pixel Addressing and Logical Functions

Direct pixel addressing provides the user access to individual pixels. The current status (color) of pixels in a defined display area can be checked, changed and stored in character arrays. Vector intersections can be marked by any of four modes: replace, OR, XOR and AND. In the replace mode, the pixel addressed will appear in the current user defined color; in the OR, XOR or AND mode, pixels appear in the color resulting from these logical operations within the user defined color mask.

Event Queuing

Software commands activate input devices individually as needed. Each activated device can assemble as many as eight events in a single "event queue," so input from peripherals is saved and efficiently transmitted to the host computer upon request. Event queuing maximizes user interaction and reduces the burden on host memory.

Pick Function

A local "pick" function identifies display items such as characters, segments and vectors, as well as their data base descriptions in the display list memory. It returns the segment, subsegment, subroutine level labels, cursor and pick position in screen coordinates. Local "picking," using a data tablet, joystick, or light pen, further increases user interactivity without overburdening the host.
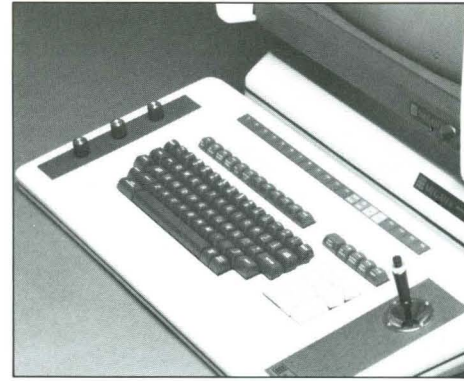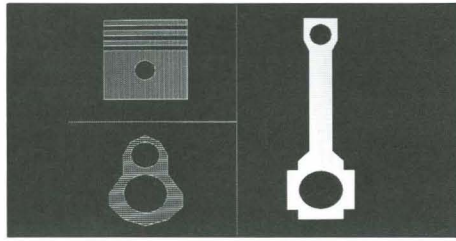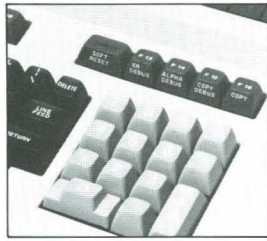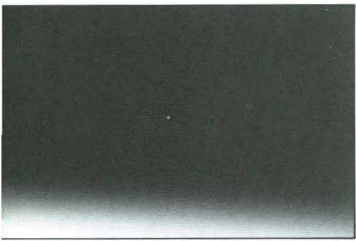
Viewport Repaint, Segment Repaint, and Cursor XORing

Viewport and segment repaint capabilities permit selective display updates without the need to blank and repaint the entire screen. If one screen section is altered, viewport repaint can be implemented. A defined screen viewport is blanked and then updated. Segment repaint permits the user to alter individual graphic segments, e.g. erasing a segment by redrawing it in the background color. Display list memory may be updated with changes made to the segment. The new segment is then displayed. Viewport and segment repaint capabilities reduce the time required to alter displayed images.

Cursor XORing through pixel memory permits the operator to reposition the cursor without accessing display list memory. It also allows cursor visibility with displayed objects and facilitates local object manipulation. Graphic entities may also be defined to function as the cursor.

GRAPHICS AND ALPHA CAPABILITY

The 1600s are DEC VT100 and VT52 compatible and follow ANSI alphanumeric terminal standards. A character overlay memory separate from graphic bit plane memory allows alpha characters and graphics to be separately or concurrently displayed, eliminating the need for a separate alpha terminal.

BROAD PERIPHERAL SUPPORT

Input Peripherals

To provide a wide range of interactivity, the 1600s support a keyboard, joystick, graphics tablet, light pen, valuator dials and function keys.

Output Peripherals

1600 systems support up to 125 colors and black and white on graphics hard copy devices through a Centronics-compatible interface. Internal multi-tasking permits full alpha terminal functions while hard copy is being produced, virtually eliminating downtime required for hard copy production.

ERGONOMIC DESIGN

Compact packaging provides operators with the convenience of desktop 1600 use. English language "set-up" menus give a selection of graphics terminal attributes such as baud rate and screen color. All menu items are accessible from the host. For still more convenience, the monitor features a tilt and swivel display with anti-glare, high contrast glass. Other features include a detachable keyboard with palm rest and sculpted keys.

DATA ANALYZER

Operators are able to examine data transferred across the interface with the 1600s' data analyzer functions. Specific "break points" can be set to capture and display graphics and alpha data. The data analyzer shows which character is being transferred across the interface and its HEX code. It also identifies data as either graphics or alphanumeric and whether it is being transferred from host to terminal or from terminal to host. Users may even single-step through commands and watch a graphics picture constructed one step at a time. This built-in analysis capability greatly aids in program development and troubleshooting.
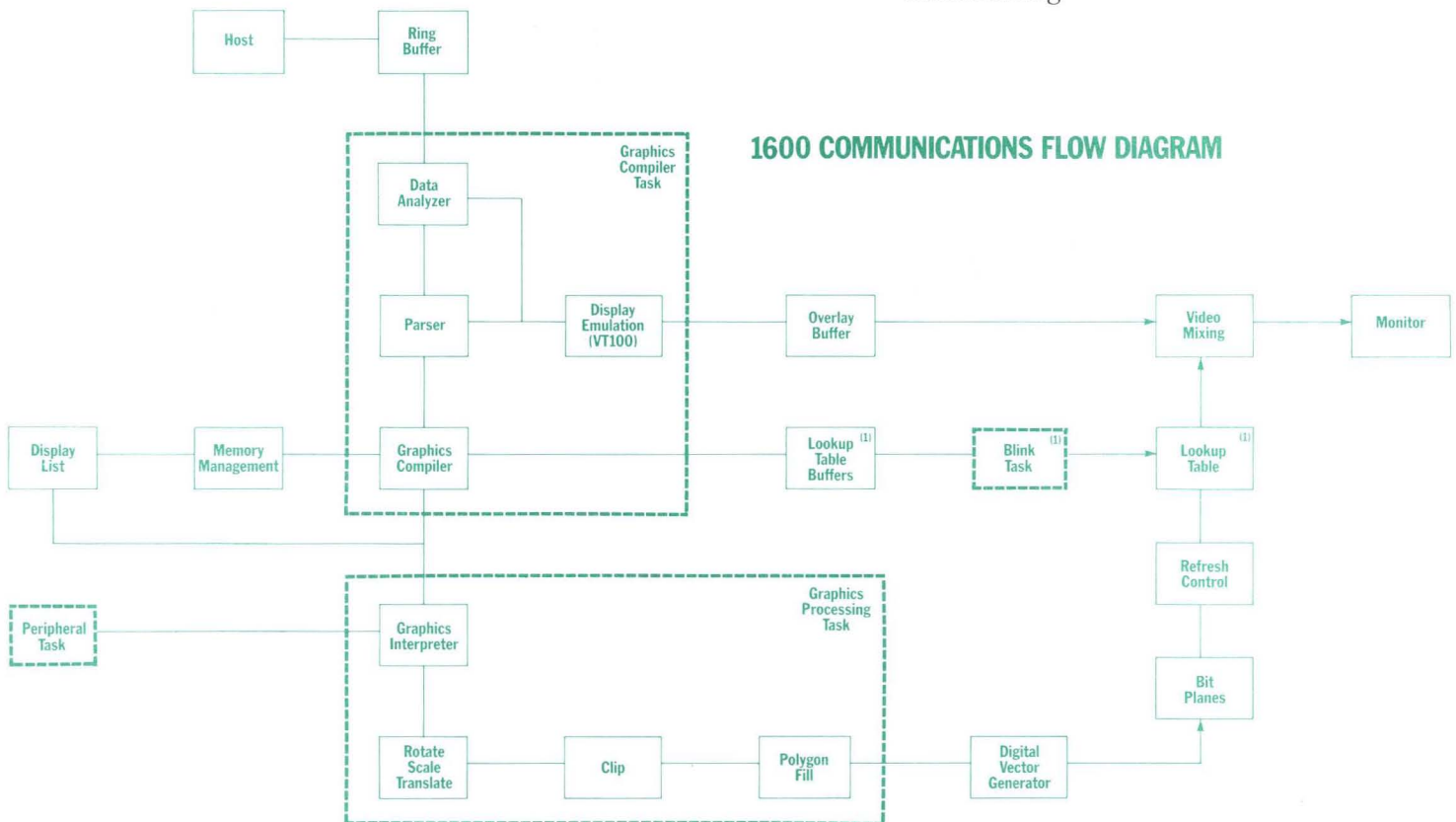
Graphics Communications Flow
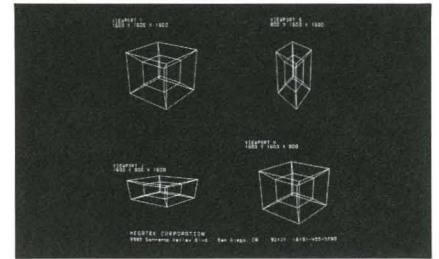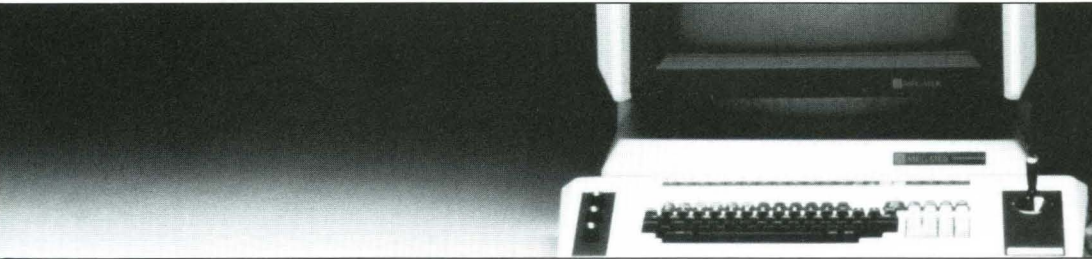
The following sections explain how data are structured, stored and manipulated in the Whizzard 1600s. The high degree of intelligence in the product provides such capabilities as local image storage, memory management, image transformation, clipping and polygon fill.
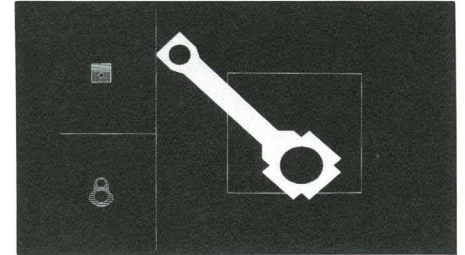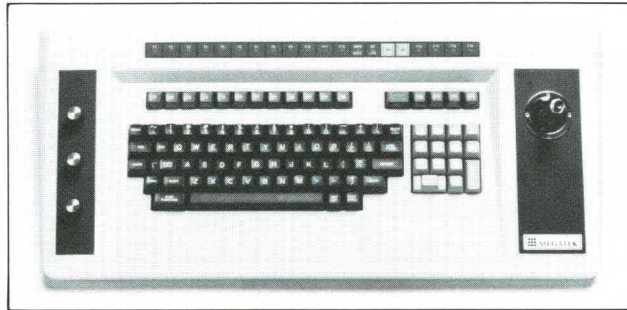
HOST INTERFACE

Communications between the host computer and the 1600s are handled through an RS-232C interface. Graphic commands transmitted from the host conform to a subset of Megatek's powerful 7600 protocol with added capabilities for direct pixel addressing, segment and viewport repaint. The interface permits data transfer into a 1024 byte buffer at rates of up to 19.2K baud and also supports automatic XON/XOFF "handshaking."

1600 COMMUNICATIONS FLOW DIAGRAM

(1)1650 Only

Graphics Communications Flow

PARSER AND COMPILER

The parser accepts information from the interface buffer, then separates it into alphanumeric data and graphics commands. Terminal alphanumeric information is written into a 32 row x 80 column character overlay. Graphic commands are compiled into executable code and placed in the display list memory.

MEMORY MANAGEMENT

Compiled graphics commands are written into display list memory under the direction of a memory management task run on the 8086. A labeled instruction group defines a segment or subroutine. These may be stored in any of the allocated 256-byte contiguous or non-contiguous memory blocks.

GRAPHICS INTERPRETER

Compiled graphics commands are read from display list memory and then executed by the 8086-based graphics interpreter to produce X-Y screen vectors.

ROTATE, SCALE AND TRANSLATE

If the graphics image is to be scaled, rotated or translated, selected vectors are intercepted and transformed in a single operation. Transformation matrices are transmitted by the host computer, and the transformations are made in the 1600s.

CLIPPING

Clip windows, defined by the host computer, are sent to the 1600s, where the clipping function is performed locally. Individual vectors are clipped at operator-established windows after the design terminal completes transformation operations.

POLYGON FILL

Borders of surfaces to be filled are defined by vectors in display list memory. After transformation and clipping, vectors are generated according to a user-selected pattern to fill the defined surface. Polygon fill options are colors, patterns and density. These selections are then sent to the digital vector generator.

DIGITAL VECTOR GENERATOR

All of the preceding Whizzard 1600 series functions are quickly executed by the 8086 microprocessor. Vector data from the display list is then converted into pixel information and stored in a 640 x 480 x 4-bit map for the 1650 and 1280 x 960 for the 1645. Megatek's proprietary bi-polar circuitry makes this conversion at 280 nanoseconds per pixel—ten times faster than general purpose microprocessors.

LOOK-UP TABLES AND BLINK

In standard mode, pixel information from bit-plane memory indexes a single 16-color look-up table to determine individual pixel colors. 1650 blinking is implemented by cycling through four color look-up tables at a user-controlled rate. Because four individual tables are accessed, objects may cycle sequentially through as many as four different colors. This blink function doesn't require a separate bit-plane, so there is no color loss.

Graphics Communications Flow
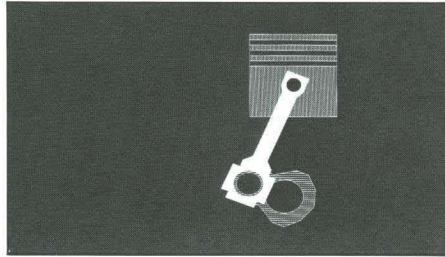
VIDEO REFRESH

The 1650's color video display refreshes at 44Hz to provide a flicker-free image. Pixel data from bit plane memory is output to the raster monitor at approximately 52 nano-seconds per pixel. The 1645 monochrome display refreshes at 30Hz interlaced, with long persistance P39 phosphors. Pixel data from bit plane memory is output to the monitor at approximately 20 nanoseconds per pixel.
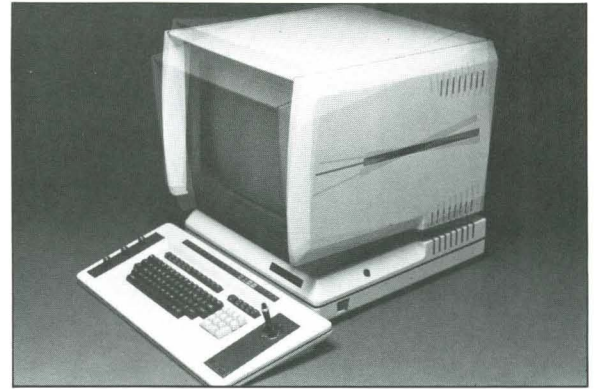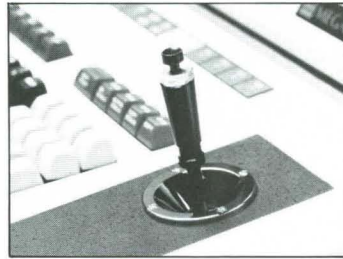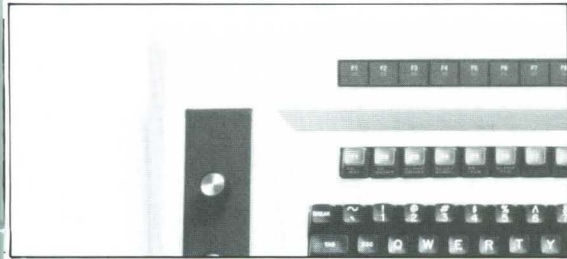
BALANCED PROCESSING

Information is processed simultaneously by the 8086 and by Megatek's digital vector generator. As a result, the 1600s maintain balanced processing throughout the entire system, providing fast, cost-effective graphics displays.
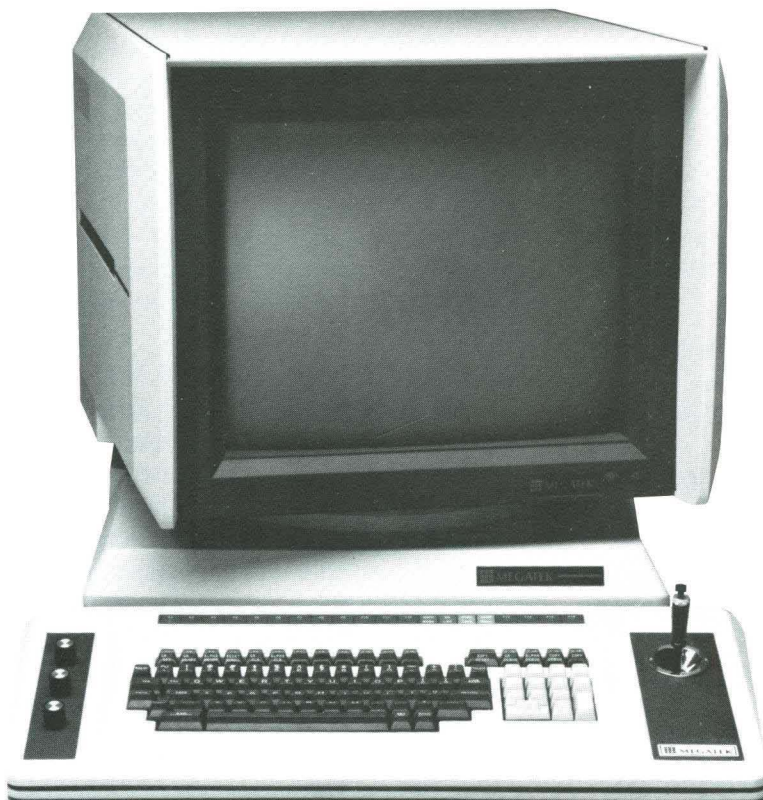
RELIABILITY & SERVICEABILITY

The 1600s' single circuit board is manufactured with highly reliable auto-insertion and auto-test processes. The system's reliability is further increased by the elimination of multi-board connectors. Built-in diagnostics can be run locally by the operator or remotely from the host computer. On-site service when required is simplified by a single board swap. Local diagnostics will confirm proper terminal function and if a problem occurs, it can be quickly isolated.

WAND™ SOFTWARE SUPPORT

The Whizzard 1600s are supported by WAND, Megatek's high-level interactive graphics software package. WAND 1600 is written in ANSI FORTRAN which makes it easy to implement on most computers. The WAND package features multi-level functionality with high-efficiency workstation level routines, supplemented by user-level routines in application coordinates. User level WAND 1600 also supports 3-D and 3-D perspective. WAND simplifies graphics programming and provides 1600 compatibility with the entire Whizzard product family.

WHIZZARD FAMILY

To meet graphic application needs, Megatek offers a wide variety of computer graphics products with a broad range of performance and functionality, including the 2-D Whizzard 6200 series, the 2-D or 3-D Whizzard 7200 and 7600 series.

MULTIPLE MICROPROCESSOR

- 8086 graphics processor
- 8085 peripheral/keyboard handler processor
- Megatek's proprietary digital vector generator

LINE TYPES

- Solid, point plot
- 16 selections of dashed line texture
- 4 bit register providing 16 preprogrammed blink rates (1650)

1600 Specifications

DISPLAY SPECIFICATIONS

- 16 colors from a palette of 4096 possible colors (1650)
- 512 x 480 or 640 x 480 screen resolution (1650)
- 1024 x 960 or 1280 x 960 screen resolution (1645)
- 4096 x 4096 virtual display space
- 19-inch screen, high contrast glass with anti-glare coating (1650)
- 44Hz frame rate interlaced (1650)
- 30Hz frame rate interlaced (1645)

PERIPHERALS

- 16 function keys, each with four methods of access
- 16 programmable function lights (on, off, fast blink, slow blink)
- Programmable sound generator for audible feedback
- Optional hardcopy interface
- Optional valuators with programmable current value, gain, threshold and bounds and optional joystick
- Optional light pen
- Optional data tablet

OPERATING ENVIRONMENT

- 15° to 40°C (59° to 104°F)
- 120 VAC or 230 VAC ±5% 50/60Hz
- 10% to 90% non-condensing relative humidity

LOCAL FUNCTIONALITY

- Local display list memory: 128K standard; 256K optional
- Local 2-D graphics transformations: rotate, continuous scale, translate and clip
- Local "Rubber Banding"

- ANSI terminal, VT100, VT52 compatible
- Tektronix 4014 compatibility
- Firmware polygon fill
- Pick highlighting
- Hardware line texture
- Firmware blink (1650)
- Hardware digital vector generation with writing rate of 280 nanoseconds per pixel
- Peripheral event queuing
- Direct pixel addressing and pixel functions (OR, XOR, replace, AND)
- Data Analyzer

ERGONOMIC FEATURES

- Display tilt and swivel; keyboard with palm rest and sculpted keys
- Detachable keyboard
- High contrast display screen with anti-reflective coating
- English language set-up menu

DIMENSIONS

Monitor	Height:	16"
	Width:	21"
	Depth:	24"
	Weight:	85 lbs.
		51 lbs. (1645)
Electronics	Height:	5"
Base	Width:	21"
	Depth:	21"
	Weight:	17 lbs.
Keyboard	Height:	3"
	Width:	25"
	Depth:	12"
	Weight:	11 lbs.
Overall	Height:	22"
	Width:	25"
	Depth:	35"
	Weight:	113 lbs.
		79 lbs. (1645)

Making History out of State-of-the-Art.

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