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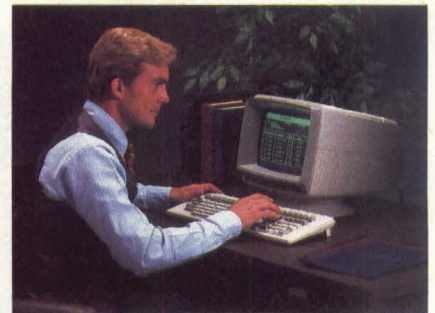
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GRAPHICS USERS GAIN FROM VENDORS' RIVALRY

Pressured by personal computer and ASCII terminal vendors, graphics terminal manufacturers fight back with lower prices and improved performance

Jerry Borrell, Senior Western Editor

Graphics terminal buyers are finding quality products at bargain prices. They see price erosion forced by ASCII terminal manufacturers entering the graphics terminal market, by personal computer products threatening to replace graphics terminals and by VLSI component technologies, allowing some graphics terminal vendors to slash prices of their high-performance products.

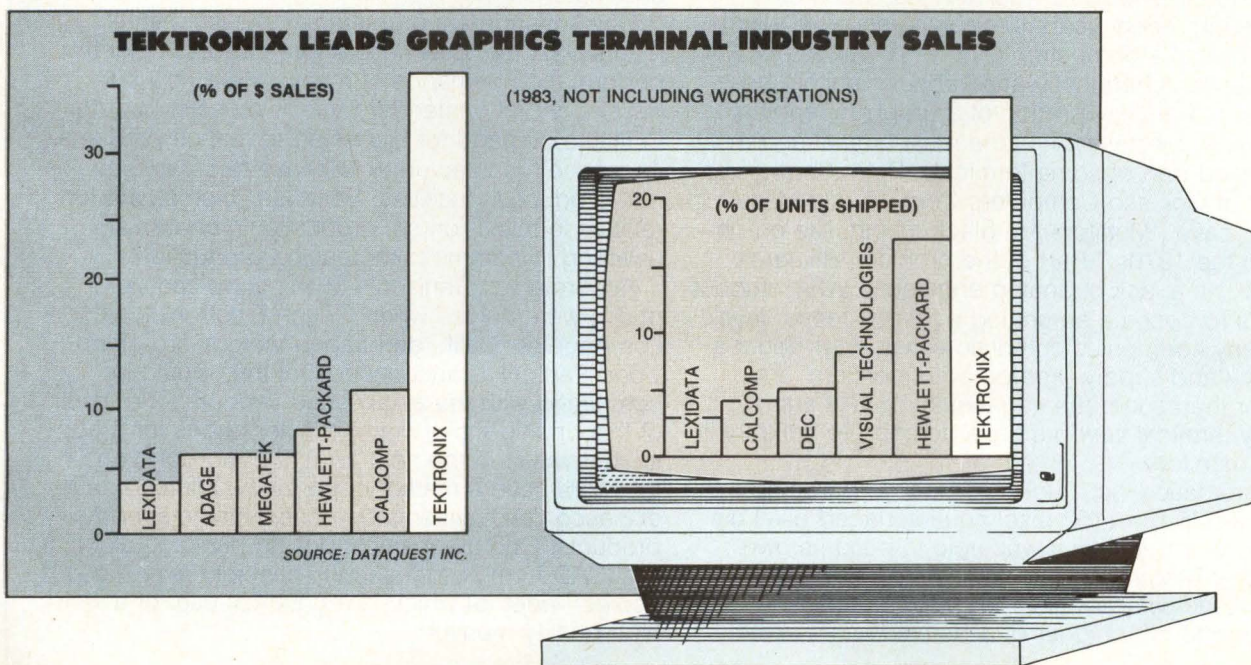
Many vendors have increased performance or created specialized application terminals. Michael Long, chief executive officer of AED Inc.,

Sunnyvale, Calif., believes, "Smaller companies must seek out vertical markets with less competition." Other terminal manufacturers have opted for the workstation marketplace. All of these approaches seem difficult to execute as price erosion has decreased the research and development funds available for new products.

ASCII manufacturers crowd in

ASCII terminal vendors, whose markets have become increasingly competitive, view graphics as an avenue to higher profits. They released a flood of retrofitted monochrome terminals that produce graphics by adding graphics boards to

Dollar volumes and unit shipments vary because the unit prices of the terminals of the different vendors vary.



GRAPHICS TERMINALS

ASCII terminals. But Walt Keller, president of graphics terminal maker GraphOn Corp., Campbell, Calif., contends, "Retrofit terminals offer relatively poor graphics and have a limited life." Keller says that retrofit terminals are plagued by limited cooling or insufficient power supplies.

Like ASCII terminals, monochrome terminals with add-in graphics boards must contend with price erosion, commodity manufacturing, distributor-oriented sales and offshore manufacturing. Dan Johnson, director of graphics products at CIE Terminals, Irvine, Calif., remains positive about the market, saying, "Graphics terminal sales will never be as competitive as ASCII because of the need for more manufacturer

interaction in the sale." Keith Rapp, general manager of the Terminals Division for Qume Corp. in San Jose, Calif., concurs: "The markets and products are not the same. You have different development cycles for the product, different user environments, a longer selling cycle and a need for more customer support."

An indication of the intensity of the upcoming competition is demonstrated by the number of board vendors leaving the retrofit board market to sell graphics terminals. Keith J. Sutton, vice president of marketing at Digital Engineering Inc., Sacramento, Calif., recalls, "Over the last six years, we have shipped over 35,000 boards, primarily for the retrofit of Lear Siegler [Inc.]

Monitors: a visible issue

If the terminal industry can be said to suffer from a lack of standards, then monitors are almost anarchic. Peter Portoulis, vice president of Conrac Corp., Covina, Calif., notes, "A majority of our products are built to a unique customer specification." Mitsubishi Electronics America Inc., on the other hand, "addresses the terminal marketplace by producing a wide selection of products—over 50 different models," says Don Aarons, national sales manager for display products.

The term "monitor" refers to a CRT-based display device that has been modified to allow the red, green and blue color signals to be directed as either a composite video signal or as a red-green-blue signal. The word "monitor" has been extended in recent years to apply to any CRT display attached to a computer.

Questions frequently arise about monitors because the display portion of a graphics terminal is judged subjectively. It is the most crucial and most criticized part of some terminals. Peter Shaw, president of Genisco Computers Corp., Costa Mesa, Calif., says, "Monitors are black magic, like graphics in the 1970s." Part of the problem, declares Shaw, "is a lack of analog engineers. What student wants to become an analog engineer these days?"

Many companies complain vehemently about a quality and supply problem with monitors and, rather than suffer the vagaries of market supply, many terminal vendors have decided to build their own monitors.

Chromatics Inc., Tucker, Ga., says it was able to offer 1,536-by-1,152-pixel non-interlaced pixel displays only because it was able to build its own display. Megatek Corp., San Diego, developed its patented "pixel-phasing" displays because it needed to offer higher quality than was commer-

cially available. Company president Paul Huber concedes, "Initially, we had some problems, but they've been solved." Ken Dozier, president of IMI Inc., Westlake Village, Calif., recalls his company's three-year effort to build its own monitor. "We wanted a display with the equivalent of 4,096-by-4,096[-pixel] resolution and found nothing available." Dozier's company handles exotic applications for military and film industry customers where high resolution and performance are required.

Opinions about quality and supply vary with system integrators. The majority of color tubes originate in Japan. There are exceptions: Barco Industries, Conrac, RCA Data Communications Products and Motorola Inc.

One key industry problem says Seiko Instruments USA Inc. president Andrew Wei, "is that the performance demands of monitors are now surpassing those of standard television sets. In order to fill the demand for higher performance products, Japanese manufacturers will have to create separate production facilities. Because volumes are low, relative to television set production, vendors are unwilling to commit to increasing production."

According to Genisco's Shaw, some monitor prices were halved when C. Itoh Electronics Inc., Los Angeles, Calif., and Japan Victor Corp., Elmwood Park, N.J., announced that they would be competing with the established vendors. The result of this pricing move may be lower prices for graphics terminals. In the near term, the monitor manufacturers have a market opportunity. Microcomputer-based CAD systems open new markets for their products. One mechanical design package alone, AutoCAD from Autodesk Inc., has sold over 13,000 copies—each of which is a potential user of a high-quality monitor.

and Digital Equipment [Corp.] products. While we continue to build retrofit cards, we now build the HiScan graphics terminal as well."

Ken Bethuel, national sales manager of Falco Data Products Inc., Sunnyvale, Calif., claims that, "The retrofit market is dying because users want faster turnaround and easier service for their graphics terminals." Bethuel points out that key retrofit manufacturers such as Digital Engineering, Selanar Corp., and ID Systems Corp. have introduced graphics terminals.

The crucial elements for success in the low-cost monochrome/graphics terminal market are marketing strength and compatibility with available software. Hardware performance will not be a marketing advantage unless, as one manufacturer notes, "someone introduces a 1,024-by-1,024-[pixel] resolution monochrome terminal during 1985 for under \$2,000. That will return performance to the forefront."

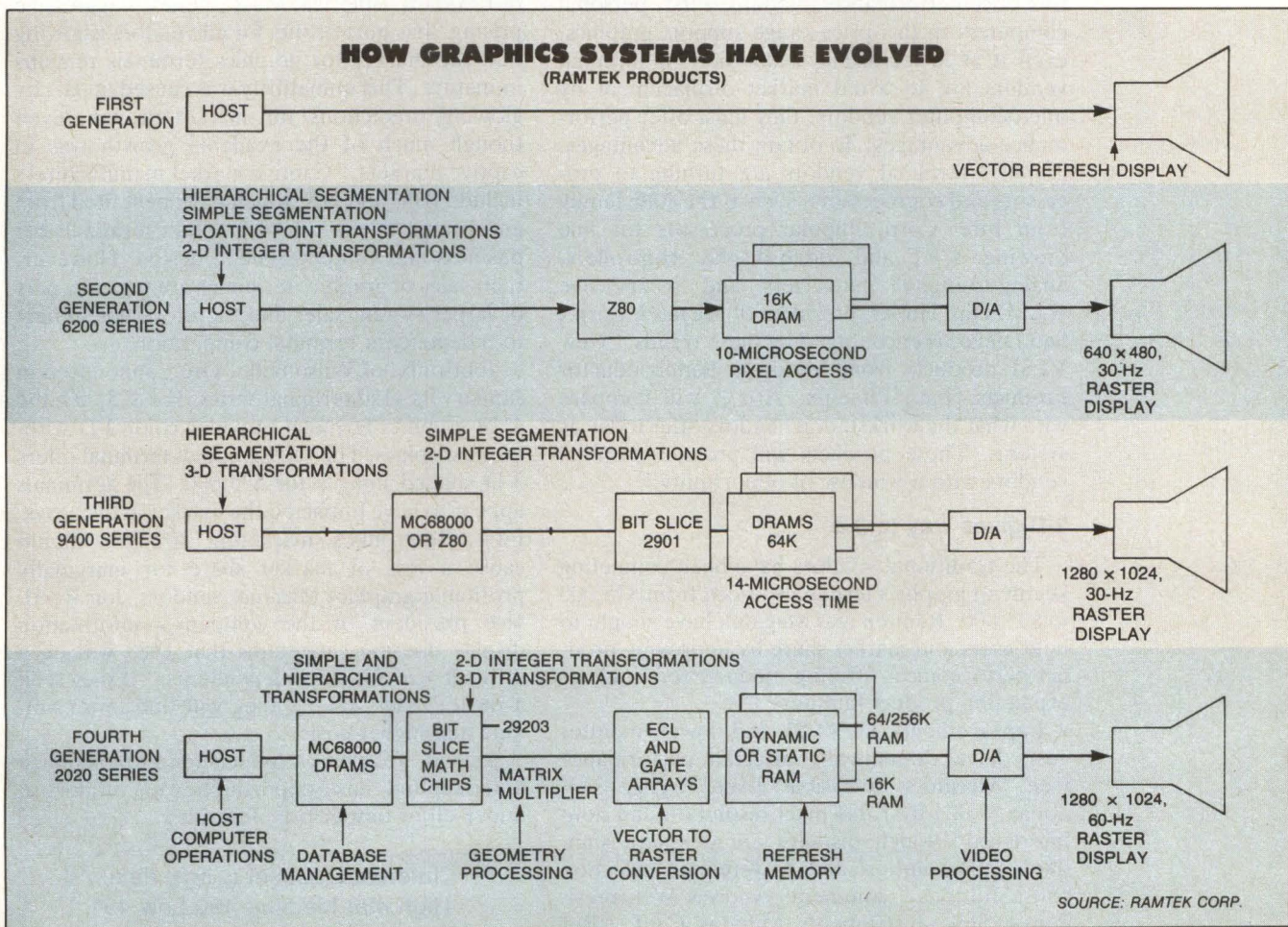
As the graphics terminal market has grown, so has its dependence upon software. Because each manufacturer has unique ways of incorporating display functions, software developers must

write individual device drivers for graphics terminals, in the view of Dan Jorgenson, product marketing manager at the terminal division of Hewlett-Packard Co. Developers find little incentive for this task because of the varied graphics terminals available and low profit margins.

David Deans, president of Intecolor Corp., Norcross, Ga., says this emulation "confirms that terminal trends are established by a market leader. It's unlikely that any one of 40 vendors will establish standards that depart from the Tektronix-installed base. In fact, Tektronix is bigger in graphics than IBM [Corp.]" Within associated areas, other manufacturers have achieved similar recognition.

Because DEC's 240 and 241 video terminal sales have taken off, emulation of these products has begun. New products from CIE Terminals, Qume and Digital Engineering all contain DEC emulation. Emulation of the 240 and 241 allows Regis, DEC's graphics instruction set, to be used for basic functions. "At least part of the success of the DEC 240 and 241," contends Pan Kamal, senior marketing specialist at DEC, Maynard,

Many vendors have increased performance or created specialized application terminals.



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GRAPHICS TERMINALS

Mass., "was our incorporation of Tektronix 4010 and 4014 terminal emulation into the product line, [which indicates] the extent to which emulation plays a role in the market."

The features most important in the graphics marketplace are color, resolution (the number of picture elements, or pixels, displayed) and cost. In 1982, Ramtek Corp. and Chromatics Inc. were among the first to offer color terminals with a resolution in the 500-by-500-pixel area for about \$5,000. In 1983 and 1984, there was a flurry of announcements of low-cost color terminals with emphasis on performance and resolution. For example, Seiko Instruments USA Inc.'s, GR-1104 graphics terminal offers 1,180-by-740-pixel resolution at just under \$5,000. Digital Engineering's HiScan terminal offers 800-by-300-pixel resolution and a faster writing speed (1 million pixels per second) but is priced under \$3,000. To outsell these products, independent vendors must introduce products with 1,024-by-1,024-pixel resolution for roughly \$2,500.

Two forces are driving manufacturers toward this price/performance standard. First, personal computers in this price range support graphics, even if at lower display resolution. If terminal vendors are to avoid market displacement by microcomputer vendors, they must offer performance advantages. To obtain these advantages, graphics terminal vendors are turning to processors and coprocessors, such as the 8086 family from Intel Corp., bipolar processors for line drawing, CRT and video-display controllers, analog-to-digital converters and inexpensive RAM. Paul Huber, president of Megatek Corp., San Diego, is encouraged by these trends, "New VLSI products from Motorola Semiconductor Products [Inc., Phoenix, Ariz.], will compare with what the workstation vendors offer today as systems. These products will provide terminal vendors with a window of opportunity."

2-D gives way to 3-D

The traditional vendors have been competing keenly in graphics terminals priced from \$15,000 to \$35,000. Ramtek and Megatek have sought to hold users and market share by improving product performance, offering modular terminals or expanding product families.

Improvements in VLSI and lower monitor costs have dramatically affected performance (see "Monitors: a visible issue," Page 84). Today, 1,024-by-1,024-pixel resolution and non-interlaced 19-inch displays are de facto standards. "Resolution and cost remain selection considerations," comments Andrew Wei, president of Seiko Instruments, Milpitas, Calif., "But

other factors are more important, such as how fast [terminals] can manipulate data for rotation and translation, or the amount of color depth." The use of four, 24, or 48 planes is important because of memory cost and because applications such as solids modeling require many colors. "Another criterion," continues Wei, "is the display list that determines how complex an object can be stored within the terminal."

User-acceptance of 3-D applications boosted 1984 sales of long-standing graphics companies offering 3-D products, such as Adage Inc., Evans and Sutherland, Genisco Computers Corp., Lexidata Corp., Megatek and Ramtek. New vendors that have incorporated 3-D capability include Cubicomp Inc., Jupiter Systems Inc., Spectragraphics Corp., New GEA Corp., CGX Corp. and Silicon Graphics Corp.

All these companies are competitive in the under-\$50,000 class. But the intense nature of the competition for 3-D terminals became evident in mid-1984 when Evans and Sutherland dropped its 3-D color display systems price from over \$90,000 to \$48,000. Ross Belson, president of Lexidata, Billerica, Mass., believes aggressive pricing "has hurt profits for all vendors, showing that the market for graphics terminals remains immature. This immaturity was caused in part by glowing predictions for market growth, even though much of the available growth was in captive markets." Captive market manufacturers include IBM and HP, which have benefited from an upsurge in the use of graphics terminals for business and computer-aided design. However, their sales of graphics terminals are typically part of larger system sales and therefore not subject to independent terminal competition.

Tektronix, of Wilsonville, Ore., announced in January its 4120 terminal series. For \$25,000, the 4128 graphics terminal provides color 3-D wire-frame displays. The 4129 graphics terminal offers 3-D shaded images for \$35,000. The terminals appear to have impacted the market in two ways. First, Tektronix's marketing strength should cause a loss of market share for marginally profitable graphics terminal vendors. Jon Reed, vice president of the company's information display division, maintains that 1985 will be a difficult year for the independents. "If they seek a niche," says Reed, "they will find lower volume and higher costs."

Second, Tektronix products tend to legitimize a market and make opportunities for vendors to undersell or outperform Tektronix. □

**Interest Quotient (Circle One)
High 489 Medium 490 Low 491**

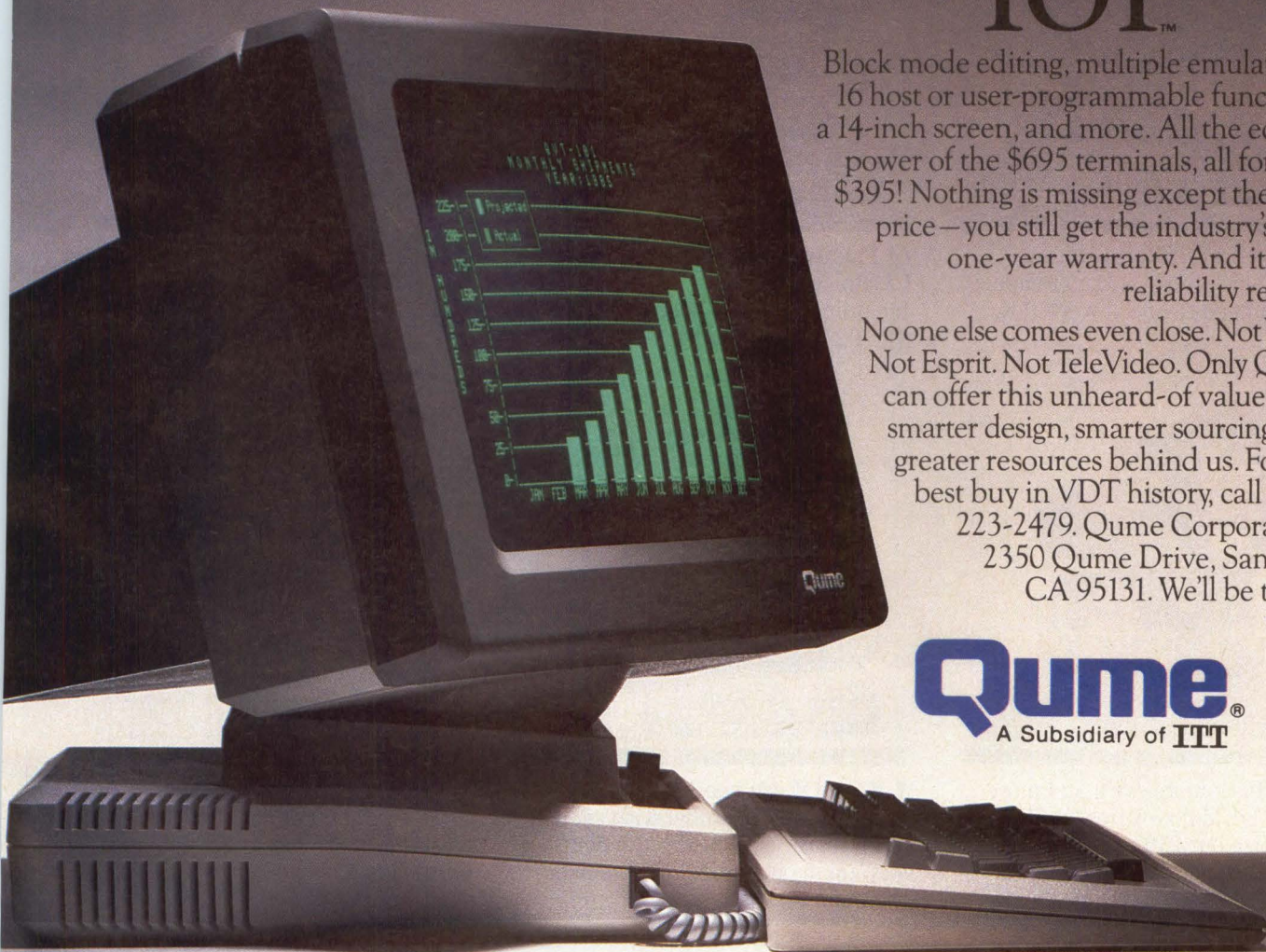
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2 Only at the expense of features. Often it's obvious where they've cut corners: With a pug-ugly box. But as you can see, the Ampex 210 is sleekly ergonomic.



3 We human-engineered the Ampex 210 with a full 14" screen that tilts and swivels to just the angle you need. So it's comfortable to use, no matter how you're positioned.



7 As well as the local editing and block mode transfer capacities you need to speed work flow.



8 Plus 16 resident emulations you can switch at the touch of a key. Including the TeleVideo 910, 910+, 912, 920 or 925*..



9 The Lear Siegler ADM 3, ADM 3A, 3A+ or ADM 5*..



13 What's more, we'll add more. In OEM quantities, we'll customize our 210's appearance, personality and programming so it's perfectly suited to your needs.



14 And if you need a more powerful terminal with even more features, consider the next step up in our family of terminals: the Ampex 230.



15 We back every Ampex terminal with a six month warranty and a worldwide service network.

Positioned to Meet Your Needs.



4 We also equipped it with a low-profile, Selectric-style, adjustable-slope keyboard for easy typing.



5 And with a soothing, flicker-free amber screen for easy reading. (If you prefer, you can have the option of green at no extra cost.)



6 But ergonomics are just the beginning. The Ampex 210 is as beautifully engineered inside as outside. With line graphics and a bidirectional printer port as standard features.



10 The Esprit (Hazeltine) 1400, 1410 or 1500*..



11 ADDS Regent 20, 25 and Viewpoint*..



12 And Qume's QVT 102*..



16 How can we pack all that into the Ampex 210 for just \$549? We're in a position to be competitive. We can take advantage of over 25 years of video, computer peripheral and offshore manufacturing experience.



17 So if you need a well-designed, full-featured terminal, call us at 800 621-0292. Or 800 821-9473 in California. We'll show you how you can be very comfortably situated for just \$549.

AMPEX

18 The Ampex 210 is from the Computer Products Division of Ampex Corporation. One of The Signal Companies ☛

GRAPHICS DISPLAY TERMINALS

TABLE 7

Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
ADDS (APPLIED DIGITAL DATA SYSTEM INC.)							
X5A	14-inch; black, white, red, green, blue, cyan, magenta, yellow; 16-color; 4096-color palette	512 x 390					
XK-1	15-inch, monochrome	1024 x 780	80 x 25, 132 x 25 (10 x 13)	RS232C (X-on/X-off, DTR)	DEC VT100; TeleVideo 925; Tektronix 4010, 4014		pan, zoom, arc, circle generation, eclipse, polygon fill, multiple patterns, rubber banding, 1 bit plane, 4 character sizes, composite video
XK-19	19-inch, monochrome	1024 x 780	80 x 25, 132 x 25 (10 x 13)	RS232C (X-on/X-off, DTR)	DEC VT100; TeleVideo 925; Tektronix 4010, 4014		pan, zoom, arc, circle generation, eclipse, polygon fill, multiple patterns, rubber banding, 1 bit plane, 4 character sizes, composite video
ADAGE INC.							
Adage 6080	19-inch; 256-color, 4096-color palette	1024 x 1024					tilt, swivel, 32 programmable function keys
AED INC. (ADVANCED ELECTRONIC DESIGN)							
Colorware 512	19-inch, 256-color, 16.7-million-color palette	512 x 483	85 x 69 (5 x 7, 7 x 9)	RS232C, parallel, Centronics (X-on/X-off)	Tektronix 4000 series	5,745	zoom; pan; polygon fill; anti-aliasing; 113 protocol commands; 8 bit planes; Q-bus-, Unibus-compatible; rackmount; RGB video output
Colorware 767	19-inch, 256-color, 16.7-million-color palette	767 x 575	85 x 69 (5 x 7, 7 x 9)	RS232C, parallel, Centronics (X-on/X-off)	Tektronix 4000 series	7,795	zoom; pan; close-curve polygon fill; anti-aliasing; 113 protocol commands; 8 bit planes; Q-bus-, Unibus-compatible; rackmount; RGB video output
Colorware 1024	19-inch, 256-color, 16.7-million-color palette	1024 x 768	85 x 69 (5 x 6, 7 x 9, 10 x 12, 14 x 18)	RS232C, parallel, Centronics (X-on/X-off)	Tektronix 4000 series	9,995	zoom; pan; close-curve polygon fill; anti-aliasing; 113 protocol commands; 8 bit planes; Q-bus-, Unibus-compatible; rackmount; RGB video output
ANN ARBOR TERMINALS INC.							
Ambassador GXL	15-inch, green	768 x 600	60 x 80 (7 x 9)	RS232C (X-on/X-off)	ANSI X3.64	3,090	polygon fill, window generation, point plot mode, 1 bit plane, diagnostics, alpha-graphics characters
Ambassador GXL + Plus	15-inch, green	768 x 600	60 x 80 (7 x 9)	RS232C (X-on/X-off)	ANSI X3.64	3,590	polygon fill; window generation; point plot mode; 1 bit plane; Greek, math and user-defined character set; diagnostics
ASEA INDUSTRIAL SYSTEMS INC. (PROCESS AUTOMATION DIV.)							
Tesselator 520	13-, 16-, 19-, 25-inch; 8-color; 64-color palette	720 x 336	80 x 24 (9 x 12)	RS232C, current loop (X-on/X-off)			1 bit plane, built-in modem, RGB video output
Tesselator 8000	13-, 16-, 19-, 25-inch; 16-color; 64-color palette	720 x 336	120 x 56 (user-definable)	RS232C, RS422, current loop (ADLP-10, X.25 level 2)			zoom, pan, 3 bit planes, rackmount, built-in modem, foreign language version, RGB video output
AYDIN CONTROLS							
Aycon 5215	13-, 19-, 25-inch; 16-color; 16-color palette	512 x 256	80 x 48 (5 x 5, 7 x 9)	RS232C, parallel (bisynch)		10,000	Unibus-, Q-bus-compatible; RGB video output
Tribune 2010	13-, 19-, 25-inch; 256-color; 4096-color palette	512 x 512, 640 x 480, 768 x 576, 1024 x 768, 1024 x 1024		RS232C, RS422		9,300	zoom, pan, 8 bit planes

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Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (matrix character size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
2300 Series	13-, 19-, 25-inch; 16-color; 256-color palette	512 x 512, 648 x 480, 640 x 512		RS232C (HDLC, X.25)	DEC VT100	19,000	5 bit planes
5219	19-inch, 16-color	560 x 336	80 x 48 (8 x 8, 8 x 16)	RS232C (X-on/X-off)		3,100	RGB video output, printer output
BURROUGHS CORP.							
ET2000 Series	14-inch, 8-color, 256-color palette	640 x 480	80 x 24, 40 x 12 (8 x 18)	RS232C; TDI; BDAA; CCITT V.24, V.28 (X-on/X-off, bisynch, asynch)	DEC VT52, VT100, VT101; Tektronix 4010; IBM 3101, 3270, 3780	3,000-8,000	split-screen, arc, circle/rectangle generation, mosaic, 3 bit planes, proprietary bus-compatible, foreign language version
GP2000 RGP	19-inch; 8-color; 262, 144-color palette	1024 x 768	80 x 32 (5 x 7)	RS232C		70,000-150,000	
CALCOMP							
Vistagraphic 4500	19-inch, 256-color, 4096-color palette	1280 x 1024		RS232C, parallel	DEC PDP-11, VAX; SEL		circles, ellipses, vectors; rectangle, pattern, polygon fill; 4, 8 bit planes; rackmount
CIE TERMINALS							
CIT-414A	12-inch, green	640 x 480	80 x 24 (7 x 14)	RS232C, current loop (X-on/X-off, RTS/CTS, asynch)	Tektronix 4010, 4014; DEC editors	1,495	simulated pan and zoom; split-screen; vector plotting; 4 character sizes; DEC LA100-, Epson MX-80-, C. Itoh 8510-compatible
CIT-467	12-inch, 8-color	570 x 480	132 x 24 (7 x 9, 9 x 9)	RS232C, current loop (X-on/X-off, RTS/CTS)	Tektronix 4010, 4014; DEC VT100	2,995	simulated pan and zoom, split-screen
CIFER PLC							
3842	15-inch; green, amber	1056 x 300	80 x 24, 132 x 25 (13 x 12, 8 x 12)	RS232C, RS423 (X-on/X-off, CTS, DTR)	DEC VT100, Tektronix 4010		2 bit planes, 2 bidirectional RS232C ports
T4	12-inch; green, amber	1056 x 300	80 x 24, 132 x 25 (13 x 12, 8 x 12)	RS232C (X-on/X-off, CTS, DTR)	DEC VT52, VT100; Tektronix 4010		2 bit planes
T5	12-inch; green, amber	1056 x 300	80 x 24, 132 x 25 (13 x 12, 8 x 12)	RS232C (X-on/X-off, CTS, DTR)	DEC VT52, VT100, VT200; Tektronix 4014		2 bit planes
COLORGRAPHIC COMMUNICATIONS CORP.							
MVI-100 Model 100/113/119	13-, 19-inch; 8-color	640 x 480	80 x 24, 80 x 48 (8 x 10)	RS232C (X-on/X-off)	DEC VT52, VT100; IBM 3101; Lear Siegler ADM-3; ADDS Regent 40; Hazeltine 1510	2,750/2,750/3,250	split-screen, arc, circle/rectangle generation, polygon fill, diagnostics, rackmount; opt. light pen
MVI-100 Model 489	19-inch, 8-color	640 x 480	80 x 24, 80 x 48 (8 x 10)	RS232C (X-on/X-off)	DEC VT52, VT100	5,500	zoom, pan, scroll, vectors, arc, circle generation, geometric, complete fill, 4 bit planes, diagnostics, rackmount, macro memory
MVI-100 Model 813/819	13-, 19-inch; 8-color	640 x 384	80 x 24, 80 x 48 (8 x 8)	RS232C (X-on/X-off)	ISC 8001G; DEC VT52, VT100	3,000/3,500	split-screen, arc, circle/rectangle generation, polygon fill, diagnostics, rackmount; opt. light pen
MVI-100 Model 820	13-, 19-inch; 8-color	640 x 480	80 x 24, 80 x 48 (8 x 10)	RS232C (X-on/X-off)	ISC 80016; DEC VT52, VT100	3,250	zoom, pan, split-screen, arc, circle/rectangle generation, polygon fill, diagnostics, rackmount
MVI-100 Model 820XL	13-, 19-inch; 8-color	640 x 480	80 x 24, 80 x 48 (8 x 10)	RS232C (X-on/X-off)	ISC 8001G; DEC VT52, VT100	5,500	zoom, pan, scroll, vectors, arc, circle generation, geometric, complete fill, 4 bit planes, diagnostics, rackmount, macro memory
DACOLL LTD.							
	12-inch, green	1024 x 1024	80 x 25	RS232C, Centronics, parallel (DTR, X-on/X-off, ICL C03)	Tektronix 4010, PLOT 10; DEC VT52		view hidden memory, trail
DATAMEDIA CORP.							
ColorScan 10 Retro-Graphics	12-inch, 64-color	640 x 480	132 x 24 (7 x 9)	RS232C, current loop (X-on/X-off)	DEC VT100; Tektronix 4027, 4010		point plotting, vector drawing, arc, circle generation, polygon drawing, fill formats; opt. RGB video output, light pen

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Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines (matrix character size))	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
ColorScan 30 Retro-Graphics	12-inch, 64-color	640 x 480	132 x 24 (7 x 9)	RS232C, current loop (X-on/X-off)	ADDS 25; Lear Siegler ADM-3A; Tektronix 4027, 4010		point plotting, vector drawing, arc, circle generation, polygon drawing, fill formats; opt. RGB video output, light pen
DIGITAL ENGINEERING INC.							
HiSCAN 4205	14-inch, 16-color, 64-color palette	800 x 300	(10 x 10)	RS232C	DEC ReGIS, VT220; Tektronix 4010, 4014, 4027, 4105		light pen, mouse; opt. current loop
HiSCAN 4210	12-inch; white, amber, green	800 x 600	(10 x 20)	RS232C	DEC ReGIS, VT220; Tektronix 4105, 4010, 4014, 4027		light pen, mouse; opt. current loop
DIGITAL EQUIPMENT CORP.							
VT240	12-inch; green, amber, white	800 x 240	132 x 24 (8 x 9)	RS232C, RS423, cur- rent loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	2,195	polygon fill, all ReGIS com- mands, 2 bit planes, RS170 video output, multinational character set, printer port, DEC VT220 functionality
VT241	13-inch, 4-color, 64-color palette	800 x 240	132 x 24 (8 x 10)	RS232C, RS423, cur- rent loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	3,195	polygon fill, all ReGIS com- mands, RGB, RS170 video output, multinational character set, printer port, DEC VT220 functionality
EVANS & SUTHERLAND							
PS 330	19-inch, 1801-color			RS232C, RS422, DEC parallel (X-on/X-off)	DEC VT100		
GENISCO COMPUTERS CORP.							
G-1000	19-inch, b&w	1024 x 792	146 x 66 (7 x 12)	RS232C (X-on/X-off)	DEC VT100, Tektronix 4014		alphanumeric overlay, selective erase, write through mode, 5 vector formats, 1 bit plane
G-2000	19-inch, 16-color, 4096- color palette	1024 x 792	146 x 66 (7 x 12)	RS232C (X-on/X-off)	DEC VT100, Tektronix 4014		alphanumeric overlay, selective erase, zoom, write through mode, 5 vector formats, 4 bit planes; opt. ergonomic termi- nal, rackmount controller
G-6000	19-inch, 16-million- color, 16-million- color palette	512 x 256, 1280 x 1024	182 x 85 (7 x 12)	DMA interface for DEC VAX (DMA interface for DEC VAX)			character, vector circle/ rectangle generation, polygon fill, word and bit scroll, up to 32 bit planes
G-8000	19-inch, 4096-color, 16-million-color palette	1280 x 1024	198 x 85 (7 x 12)	RS232C, RS422, DMA interface for DEC VAX (X-on/X-off)	DEC VT100, Tektronix		up to 12 bit planes
GRAPHON CORP.							
GO-140	12-inch; green, amber, b&w	512 x 390	80 x 24, 132 x 24 (7 x 12, 5 x 12)	RS232C (X-on/X-off)	DEC VT52, VT100, VT102; Tektronix 4010, 4012, 4013	1,995	split-screen, rectangle fill, 1 bit plane, diagnostics, bidirec- tional printer port
GO-160	12-inch; green, amber, b&w	1024 x 390	132 x 25	RS232C, RS422 (X-on/X-off, DTR)	DEC VT52, VT100, VT102; Tektronix 4010, 4013, 4014, 4015		split-screen, rectangle fill, 2 bit planes, gray scale, alpha over- lay on graphics, printer and mouse ports
HMW ENTERPRISES INC.							
9081	19-inch, 8-color	480 x 384	80 x 48 (5 x 7)	RS232C, current loop (X-on/X-off, ASCII asynch)	ADDS 980; DEC VT100; ISC 8001G, 8001R	5,000	opt. RS170 video output, rack- mount, line and printer ports
9083-S	13-inch, 8-color	480 x 384	80 x 48 (5 x 7)	RS232C, current loop (X-on/X-off, ASCII asynch)	ADDS 980; DEC VT100; ISC 8001G, 8001R	3,995	opt. 16-page display
9203	13-inch, 8-color	480 x 384	80 x 48 (5 x 7)	RS232C, current loop (X-on/X-off, ASCII asynch)	ADDS 980; DEC VT100; ISC 8001G, 8001R	5,500	
9204	13-inch, 8-color	480 x 384	80 x 48 (5 x 7)	RS232C, current loop (X-on/X-off, ASCII asynch)	ADDS 980; DEC VT100; ISC 8001G, 8001R	12,000- 15,000	special graphics characters

GRAPHICS DISPLAY TERMINALS

TABLE 7

Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines (matrix character size))	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
HEWLETT-PACKARD CORP.							
HP2623A	12-inch; white, green, amber	512 x 390	80 x 24 (7 x 11)	RS232C, RS422, current loop (ENQ/ACK, X-on/X-off)	DEC VT52, ANSI X3.64, Tektronix 4010		line, text, rubberband line, rectangular area fill, 1 bit plane, 8 foreign languages; opt. integral printer, composite video
HP2627A	12-inch, 8-color, 8-color palette	512 x 390	80 x 24 (7 x 11)	RS232C, RS422, current loop (ENQ/ACK, X-on/X-off)	DEC VT52, ANSI X3.64, Tektronix 4010		line, text, rubberband line, rectangular area fill, 3 bit planes, 8 foreign languages; opt. RGP video output
HUMAN DESIGNED SYSTEMS INC.							
Concept GVT +	12-inch; amber, green, white	250 x 512	80 x 24, 132 x 24 (7 x 11, 5 x 9)	RS232C, current loop (X-on/X-off, CTS/RTS)	DEC VT52, VT100; Tektronix 4010, 4014	1,695	block fill, point plot, multiple line types, graphics memory dump/load, selective erasure, 1 bit plane, 46 programmable key functions; opt. joystick
Concept GVT-APL +	12-inch; amber, green, white	250 x 512	80 x 24, 132 x 24 (7 x 11, 5 x 9)	RS232C, current loop (X-on/X-off, CTS/RTS)	DEC VT52, VT100; Tektronix 4013, 4014, 4015	1,995	block fill, point plot, multiple line types, graphics memory dump/load, selective erasure, 1 bit plane, 46 programmable key functions, APL; opt. joystick
ID SYSTEMS CORP.							
ID-100	12-inch, 8-color	512 x 256, 512 x 512	8 x 24, 132 x 24 (8 x 10)	RS232C, current loop (X-on/X-off)	Tektronix 4010		color fill, arcs, bars, circle generation, windowing, 4 bit planes; opt. 16-color
ID-200	12-, 14-, 19-inch; green, gray	1280 x 780	80 x 24, 132 x 24 (8 x 10, 10 x 10, 7 x 9)	RS232C, current loop (X-on/X-off)	DEC VT100; Tektronix 4010, 4014, 4027		zoom, pan, split-screen, arc, circle/rectangle generation, polygon fill, windowing, 3 bit planes, rackmount, RGB video output, joystick, mouse, blink, touch screen
ID-1024	14-, 19-inch	1024 x 1024	80 x 24, 132 x 24 (8 x 10, 10 x 10, 7 x 9)	RS232C, current loop RS170 (X-on/X-off)	DEC VT100; Tektronix 4010, 4014, 4027		zoom, pan, split-screen, arc, circle/rectangle generation, polygon fill, windowing, 3 bit planes, rackmount, RGB video output, joystick, mouse, blink, touch screen
IMLAC CORP.							
8000	19-inch, green	2048 x 2048	80 x 50	RS232C (X-on/X-off)	Tektronix 4014	1,735	calligraphic, bit pad; opt. light pen, Multibus-compatible
IMS INTERNATIONAL							
ULTIMA IV	12-inch, green, 2-color	720 x 300	132 x 24 (9 x 12)	RS232C, RS422 (CTS, X-on/X-off)	TeleVideo 920, 950; ANSI, DEC VT52	1,945	split-screen; circle/rectangle generation; polygon fill; Q-bus-Multibus-, VME-, S-100-compatible
INTEGRAPH CORP.							
DSP 046-Interpro	19-inch, 256-color, 16-million-color palette	1280 x 1024	80 x 40, 160 x 80 (16 x 24, 8 x 12)	(X-on/X-off, RTS/CTS)	DEC VT100, Tektronix 4014	42,000	zoom, pan, rotate, arc, circle, ellipse, curve generation
DSP 055-Interact	19-inch, 256-color, 16-million-color palette	1280 x 1024	80 x 40, 160 x 80 (16 x 24, 8 x 12)	RS232C, RS432 (X-on/X-off, RTS/CTS)	DEC VT100, Tektronix 4014	48,000	zoom, pan, rotate, arc, circle, ellipse, curve generation
ITHACA INTERSYSTEMS INC.							
GRAPHOS II	13-inch, 16-color, 16-color palette	640 x 480	80 x 30 (8 x 16)	RS232C, Centronics (X-on/X-off, DTR)	DEC VT100, Tektronix 4010		zoom, pan, circle generation, 4 bit planes, rackmount, 16 independent display windows
GRAPHOS III	13-, 19-inch; 16-color; 32, 768-color palette	640 x 480	80 x 30 (8 x 16)	RS232C, Centronics (X-on/X-off, DTR)	DEC VT100, Tektronix 4010		zoom, pan, circle generation, 4 bit planes, rackmount, 16 independent display windows
JAPAN COMPUTER CORP.							
JCC-2068M	19-inch, 8-color, 16-million-color palette	1024 x 780	80 x 30 (9 x 19)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100, Tektronix PLOT 10, Data General 200K		zoom, pan, arc, circle/rectangle generation, polygon fill, 24 bit planes, Versabus-compatible, light pen, diagnostics
JCC-C1421	14-inch, 16-color, 27-color palette	1024 x 780	84 x 30 (9 x 15)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, arc, circle/rectangle generation, polygon fill, 4 bit planes, diagnostics

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Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines, matrix character size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
JCC-C1431	14-inch, 16-color, 27-color palette	1024 x 780	84 x 30 (9 x 15)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, arc, circle/rectangle generation, polygon fill, 4 bit planes, diagnostics
JCC-C1441	14-inch, 8-color, 27-color palette	1024 x 780	84 x 30 (9 x 15)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, arc, circle/rectangle generation, polygon fill, 3 bit planes, diagnostics
JCC-C1468M	14-inch, 8-color, 16-million-color palette	1024 x 780	80 x 30 (9 x 19)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, arc, circle/rectangle generation, 24 bit planes, Versabus-compatible, light pen
JCC-C2022	19-inch, 16-color, 27-color palette	1024 x 780	84 x 30 (9 x 15)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, arc, circle/rectangle generation, 4 bit planes, diagnostics, light pen
JCC-M1000	12-inch; green, monochrome	640 x 486	80 x 27 (7 x 9)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, split-screen, arc, circle/rectangle generation, polygon fill, 1 bit plane, printer buffer, Japanese version
JCC-M1401 III	14-inch; green, amber, monochrome	1024 x 780	86 x 30 (12 x 24)	RS232C, current loop, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		zoom, pan, split-screen, arc, circle/rectangle generation, polygon fill, 1 bit plane, printer buffer, Japanese version
JCC-V1471	14-inch, 256-color, 4096-color palette	640 x 480	80 x 27 (9 x 15)	RS232, current loop adapter, Centronics (X-on/X-off, bisynch)	DEC VT100; Tektronix 4010, 4014; Data General 200K		8 bit planes, diagnostics, light pen, tablet
KEL INC.							
J1014	14-inch; green, monochrome	1024 x 780	146 x 64 (5 x 7, 5 x 14, 10 x 14)	RS232C (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	2,980	pan, circle/rectangle generation, reverse, 1 bit plane, user-programmable function keys, built-in diagnostics, selective erasure
J1014C	14-inch, 8-color, 8-color palette	1024 x 780	146 x 64 (5 x 7, 5 x 14, 10 x 14)	RS232C (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	4,950	pan, circle/rectangle generation, rectangle erase, reverse, 1 bit plane, user-programmable function keys, built-in diagnostics, selective erasure
J1019	19-inch; green, monochrome	1024 x 780	146 x 64 (5 x 7, 5 x 14, 10 x 14)	RS232C (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	4,860	pan, circle/rectangle generation, fill, 1 bit plane, user-programmable function keys, built-in diagnostics, selective erasure
J1019C	19-inch, 8-color, 8-color palette	1024 x 780	146 x 64 (5 x 7, 5 x 14, 10 x 14)	RS232C (X-on/X-off)	DEC VT52, VT100; Tektronix 4010, 4014	7,820	pan, circle/rectangle generation, fill, 1 bit plane, user-programmable function keys, built-in diagnostics, selective erasure
KEYNOTE COMPUTER PRODUCTS INC.							
KD 500G	12-inch; green, amber	512 x 240	80 x 24 (6 x 9)	RS232C, RS422, current loop (X-on/X-off, DTR, RTS)	DEC VT100, Tektronix 4010		split screen, arc, circle/rectangle generation, printer port, international character sets, tilt and swivel
KIMTRON CORP.							
KGT-100	12-, 14-inch; green, amber	800 x 390	132 x 25 (7 x 11)	RS232C (DTR, X-on/X-off)	DEC VT220, Tektronix 4010, 4012, 4014		arc, circle/rectangle generation, polygon fill, 1 bit plane
LANPAR TECHNOLOGIES INC.							
VISION 1000/2000+/2200+	12-inch; green, amber, monochrome	780 x 250	132 x 25 (7 x 9)	RS232C (X-on/X-off)	DEC VT100, 220; Tektronix 4010, 4014		arc, fill, box, circle generation, printer and plotter output
LEENSHIRE LTD.							
VCT 6925	14-, 20-inch; 8-color	512 x 256	80 x 32	RS232C, RS422, current loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010		circle/rectangle area fill, 3 bit planes, rackmount monitor, RGB video output, diagnostics
VCT 6926	14-, 20-inch; 8-color	512 x 515	80 x 32	RS232C, RS422, current loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010		circle/rectangle area fill, 3 bit planes, rackmount monitor, RGB video output, diagnostics

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Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format columns x lines (matrix character size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes/features, options
VCT 6927	14-, 20-inch; 64-color	960 x 384	80 x 48 (12 x 8)	RS232C, RS422, current loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010		zoom, pan, circle/rectangle area fill, 6 bit planes, rackmount monitor, RGB video output, diagnostics
VCT 6928	14-, 20-inch; 64-color	1024 x 768	80 x 48 (12 x 8)	RS232C, RS422, current loop (X-on/X-off)	DEC VT52, VT100; Tektronix 4010		zoom, pan, circle/rectangle area fill, 6 bit planes, rackmount monitor, RGB video output, diagnostics
LEXIDATA CORP.							
2400 System	19-inch, monochrome	1280 x 1024	160 x 85 (7 x 9, 14 x 18, 21 x 27, 28 x 36)	RS232C (proprietary)			pan, zoom, 12 programmable function keys, 4 variable-sized workspaces
2410 System	19-inch, 16-color, 4096-color palette	1280 x 1024	160 x 85 (7 x 9, 14 x 18, 21 x 27, 28 x 36)	RS232C (proprietary)			pan, zoom, 12 programmable function keys, 4 variable-sized workspaces
LIBERTY ELECTRONICS							
Freedom 210 Graphics/ASCII	14-inch, green	655 x 290	80 x 25, 132 x 25 (7 x 9)	RS232C (X-on/X-off)	Tektronix 4010, 4014; Lear Siegler ADM-31; Tektronix 4010, 4014	1,295	arc, circle/rectangle generation, polygon fill, 3 write modes, 1 bit plane, DEC VT series-compatible; opt. amber color
Freedom 240 Graphics/ANSI	14-inch, green	655 x 290	80 x 25, 132 x 25 (7 x 9)	RS232C (X-on/X-off)	DEC VT52, VT100, VT220; Tektronix 4010, 4014	1,395	arc, circle/rectangle generation, polygon fill, 3 write modes, 1 bit plane, DEC VT series-compatible; opt. amber color
LUNDY ELECTRONICS & SYSTEMS INC.							
5400 Series	19-inch, 16-color, 4096-color palette	1536 x 1024	80 x 32 (5 x 7, 7 x 9)	RS232C, RS422, current loop	Tektronix 4014		arc, circle/rectangle generation, polygon fill, up to 4 bit planes, 14 programmable function keys
5600 Series	19-inch, 256-color, 16.7-million-color palette	768 x 512	80 x 32 (5 x 7, 7 x 9)	RS232C, RS422, current loop	Tektronix 4010		arc, circle/rectangle generation, polygon fill, up to 8 bit planes, 14 programmable function keys
Raster UltraGraf	20-inch, 256-color, 16.7-million-color palette	1024 x 1024		16-bit parallel, RS232C			16-bit planes, segmentation
UltraGraf 3-D Graphics Design Workstation	20-inch, green			16-bit parallel			zoom, 3-D, rubberbanding
MATROX ELECTRONIC SYSTEMS LTD.							
GXT-1000	19-inch, 16-color, 4096-color palette	1024 x 768	48 x 80 (5 x 7)	RS232C (X-on/X-off)		13,010	zoom, pan, 4 bit planes; opt. rackmount, 8 bit planes
MEGADATA CORP.							
8188-8G	15-inch; green, amber, red	1024 x 800	132 x 30 (16 x 14)	RS232C (3), Centronics (asynch, bisynch)	IBM 3271, 3275, 3277, 328C; Regent 40		1 bit plane, built-in diagnostics, 128 soft character set; opt. 256 or 512 character set
8188-8GH	15-inch; green, amber, red	1360 x 98	132 x 43 (16 x 32)	RS232C (3), Centronics (asynch, bisynch)	IBM 3271, 3275, 3277, 3286; Regent 40		windowing, 2 bit planes, built-in diagnostics, 128 soft character set; opt. 256 or 512 character set
MEGATEK CORP.							
WHIZZARD 1645	19-inch, green	960 x 1280	132 x 72 (16 x 33)	RS232C (X-on/X-off)	DEC VT52, VT100; Tektronix 4014	8,900	zoom, pan, windowing, fill, 1 bit plane, 16 programmable function keys, diagnostics
WHIZZARD 1650	19-inch, 16-color, 4096-palette	640 x 480	132 x 32 (8 x 15)	RS232C (X-on/X-off)		9,900	zoom, pan, windowing, fill, 4 bit planes, 16 programmable function keys, diagnostics
WHIZZARD 3355	19-inch, 16-color, 4096-color palette	1024 x 1024	132 x 24 (12 x 18)	RS232C, IEEE 488 (X-on/X-off)	DEC VT100, Tektronix 4014	22,500	zoom, pan, windowing, surface fill, 4 bit planes, rackmount
WHIZZARD 3375	19-inch, 16-color, 4096-color palette	1024 x 1024	132 x 24 (12 x 18)	DEC Unibus (X-on/X-off)		26,500	zoom, pan, windowing, surface fill, 4 bit planes, rackmount, Unibus-compatible
WHIZZARD 7210	21-inch, white	4096 x 4096		RS232C; IEEE-488; DEC Unibus, PDP-11; Harris; Data General (X-on/X-off)		25,150	zoom, pan, windowing, fill, Unibus-compatible

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Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines (matrix character size))	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
WHIZZARD 7250	19-inch, 16-color, 4096-color palette	512 x 512		RS232C; IEEE-488; DEC Unibus, PDP-11; Harris; Data General (X-on/X-off)	Tektronix 4014	23,000	zoom, pan, windowing, 4 bit planes, rackmount, Unibus-compatible
WHIZZARD 7255	19-inch, 16-color, 4096-color palette	1024 x 1024		RS232C; IEEE-488; DEC Unibus, PDP-11; Harris, Data General (X-on/X-off)	Tektronix 4014	36,500	zoom, pan, windowing, 4 bit planes, rackmount, Unibus-compatible
MICRO-TERM INC.							
ERGO-201	12-inch; green, amber	768 x 240	80 x 25 (7 x 11)	RS232C, current loop (X-on/X-off, DTR)	DEC VT52, TeleVideo 925, Lear Siegler, ADM-3A, ADDS, Hazeltine 1410, Tektronix 4010	1,395	arc, circle/rectangle generation, fill, diagnostics, printer
ERGO 301	12-inch; green, amber	768 x 240	132 x 25 (7 x 11)	RS232C, current loop (X-on/X-off, DTR)	DEC VT52, VT100, ReGIS; Tektronix 4010, ANSI X3.64	745	zoom, pan, split-screen, arc, shading, diagnostics, printer
NEW GEA CORP.							
NWX230	19-inch, 16-color, 4096-color palette	1024 x 1024	user definable	RS232C, RS422, DEC VAX (X-on/X-off, RTS/CTS, ACK/ENQ, bisynch)	Tektronix 4014, IBM 3270	14,000	zoom; pan; split-screen; arc; polygon fill; 4 bit planes; DEC VAX-, Unibus-compatible; rackmount; RGB video output; diagnostics; foreign language version
NWX235	19-inch, 16-color, 4096-color palette	1024 x 1024	user definable	RS232C, RS422, DEC VAX (X-on/X-off, RTS/CTS, ACK/ENQ, bisynch)	Tektronix 4014, DEC VT100, IBM 3270	19,950	zoom; pan; split-screen; arc; polygon fill; 4 bit planes; DEC VAX-, Unibus-compatible; rackmount; RGB video output; diagnostics; foreign language version
NWX237	19-inch, 4096-color, 16.7-million-color palette	1280 x 1024	user definable	RS232C, RS422, DEC VAX (X-on/X-off, RTS/CTS, ACK/ENQ, bisynch)	DEC VT100, Tektronix 4014	29,950	zoom; pan; split-screen; arc; circle generation; polygon fill; rubberbanding, 16 bit planes, DEC VAX-, Unibus compatible; rackmount; RGB video output; diagnostics; foreign language version
NEWBURY DATA RECORDING LTD.							
9510	12-inch; green, amber	1024 x 260	80 x 26 (7 x 11)	RS232C, current loop (X-on/X-off, DTR)	TeleVideo 925, 950; Tektronix 4010, 4014		11 programmable function keys, non-volatile setup mode
PSITECH INC.							
GTC314	14-inch, 8-color, 4096-color palette	512 x 480	85 x 48 (programmable)	RS232C (X-on/X-off, RTS/CTS)	DEC VT52, VT100; Lear Siegler ADM-3; Tektronix 4010	2,895	arc, circle generation, fan, pie, box, polyline, polygon, 3 bit planes; opt. rackmount, mouse, digitizer, color printer
GTC327	14-inch, 8-color, 4096-color palette	640 x 480	80 x 34 (8 x 14)	RS232C (X-on/X-off, RTS/CTS)	Tektronix 4027	4,100	arc, circle generation, fan, pie, box, polyline, polygon, 3 bit planes; opt. rackmount, mouse, digitizer, color printer
GTC329A	19-inch, 16-color, 4096-color palette	512 x 480	85 x 48 (programmable)	RS232C (X-on/X-off, RTS/CTS)	DEC VT52, VT100; Lear Siegler ADM-3; Tektronix 4010	5,300	arc, circle generation, fan, pie, box, polyline, 4 bit planes; opt. rackmount, mouse, digitizer, color printer
GTC419	19-inch, 8-color	512 x 480	85 x 48 (programmable)	RS232C (X-on/X-off, RTS/CTS)	Lear Siegler ADM-3, Tektronix 4010	8,995	arc, circle generation, fan, pie, box, polyline, 3 bit planes, local storage for 160 graphic pages
SIBYL	19-inch, 2.7-million-color, 16.7-million-color palette	2730 x 1024	240 x 100 (10 x 10)	RS232C (X-on/X-off)		24,500	zoom; pan; split-screen; vectors; markers; polygon fill; multiple pages; 24 bit planes; VME-compatible; RGB, HS, VS video output; opt. mouse, digitizer
QUME CORP. (SUBSIDIARY OF ITT)							
QVT-311GX	14-inch; monochrome, 4 shades of gray	640 x 480	80 x 32 (7 x 9)	RS232C (X-on/X-off, DTR)	DEC VT52, VT100, VT125; Tektronix 4010, 4014	1,995	zoom; pan; arc; circle generation; polygon fill; 2 bit planes; Q-bus-, Unibus-, Multibus-, S-100-compatible

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TABLE 7

Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (matrix character size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
QVT-511GX	14-inch, 8-color, 64-color palette	480 x 360	80 x 30 (5 x 7)	RS232C, Centronics (X-on/X-off, DTR)	DEC VT52, VT100; Tektronix 4105, 4010, 4014	2,895	circle/rectangle generation; polygon fill; 3 bit planes; Q-bus-, Unibus-, Multibus-, S-100-compatible; foreign language version
RCA DATA COMMUNICATIONS PRODUCTS							
VP4801	12-inch, green		80 x 25 (6 x 8)	RS232C, Centronics, RJ11C (X-on/X-off, asynch)	Texas Instruments, ADDS Viewpoint		
VP5801	12-inch, green		80 x 25 (6 x 8)	RS232C, Centronics, RJ11C (X-on/X-off, asynch)	Texas Instruments, ADDS Viewpoint		
SAI TECHNOLOGY CO.							
Series 5000	11-inch, orange	512 x 512	80 x 50 (5 x 7, 7 x 9)				split-screen, scrolling, reverse video, blinking, graphics, mil-spec display system for severe environment applications
Series 7000	8.5-inch, orange	512 x 256	80 x 50 (5 x 7, 7 x 9)	RS422, RS423			split-screen, scrolling, reverse video, blinking, graphics, mil-spec display system for severe environment applications
Series 8000	13.5-inch, neon orange	576 x 640	85 x 57 (7 x 9)	serial, parallel			reverse video, blinking, graphics, mil-spec display system for severe environment applications
Series 9000	24-inch, neon orange	1024 x 1024	160 x 102 (7 x 9)	serial, parallel			polylines, polygons, polymarkers, circle generation, arcs, ellipses, conforms with PHIGS mil-spec display system for severe environment applications
SEIKO INSTRUMENTS USA INC.							
GR-1104	14-inch, 8-color, 512-color palette	1024 x 780	80 x 48 (11 x 13)	RS232C, Centronics (X-on/X-off, ENQ/ACK, DTR)	Tektronix 401X, ANSI X3.64	4,350	line, arc, circle/rectangle generation, pan, zoom, fan, mark, pixel, scale
GR-2414	20-inch, 1024-color, 32,768-color palette	1280 x 1024	132 x 64 (7 x 9, 10 x 13)	RS232C (X-on/X-off, ENQ/ACK, DTR)	Tektronix 401X	15,950	line, arc, circle/rectangle generation, polygon fill, zoom, pan, 10 bit planes, diagnostics, hardware anti-aliasing, console mode overlay, multiple logical surfaces
SPECTRAGRAPHICS CORP.							
1500	19-inch, 4096-color, 16.7-million-color palette	1024 x 1024		RS232C, Centronics, DEC Unibus (bisynch, asynch, SDLC, IBM channel, DEC Unibus, Harris channel)	DEC VT100; IBM 3250, 3278, 5080	22,000-26,000	zoom, polygon fill, circle generation, local color hardcopy, up to 12 bit planes, Unibus-compatible
SPERRY CORP. (COMPUTER SYSTEMS DIV.)							
UTS 30	12-inch; green, monochrome	375 x 512	80 x 24 (10 x 16)	RS232C (Sperry Uniscope)	TTY, KSR/ASR via CP/M	3,235-4,565	business graphics, pie, bar, line, scatter and text charts, polygon fill, hatch fill, 8 foreign character sets
UTS 60	14.5-inch, 16-color, 16-color palette	375 x 512	80 x 24 (9 x 15)	RS232C (Sperry Uniscope)	TTY, KSR/ASR via CP/M	6,218	business graphics, pie, bar, line, scatter and text charts, polygon fill, screen fill, 8 foreign character sets
SUMMIT CAD CORP.							
CAD Upgrade Package 1.0	12-inch, 16-color	640 x 400		RS232C, Centronics			RGB video output
CAD Upgrade Package 1.1	12-inch, 16-color	640 x 400		RS232C, Centronics			RGB video output
TECHEX LTD.							
OMNICOMP	19-, 20-inch; 256-color, 4096-color palette	1024 x 1024		RS232C, RS422, RS343, parallel (X-on/X-off)			8 bit planes; Q-bus-, Unibus-, Multibus-compatible; rack-mount; RGB video output

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GRAPHICS DISPLAY TERMINALS

TABLE 7

Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (columns x lines size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
VHR19-6100 SERIES	8-, 64-color; 4096-color palette	1024 x 768	132 x 32	RS232C, RS170, RS343A, current loop (X-on/X-off)	DEC VT100; Tektronix 4010, 4014		zoom; pan; split-screen; 3, 6 bit planes; RGB; synch video output
TEKTRONIX INC.							
4105	13-inch, 8-color 64-color palette	480 x 360	80 x 30, 132 x 30 (5 x 4)	RS232C, Centronics (X-on/X-off, DTR/CTR)	DEC VT52, VT100; Tektronix 4010, 4100, 4110		polygon fill; split-screen, zoom, pan, rubberbanding, 3 bit planes, 5 foreign languages, local segments
4106	13-inch, 8-color, 64-color palette	640 x 480	80 x 32, 132 x 32 (7 x 11)	RS232C, Centronics (X-on/X-off, DTR/CTR)	DEC VT52, VT100; Tektronix 4010, 4100, 4110		polygon fill, split-screen, zoom, pan, rubberbanding, 4 bit planes, 5 foreign languages, local segments
4107	13-inch, 8-color, 64-color palette	640 x 480	80 x 32, 132 x 32 (7 x 11)	RS232C, Centronics (X-on/X-off, DTR/CTR)	DEC VT52, VT100; Tektronix 4010, 4100, 4110		polygon fill, zoom, pan, rubberbanding, split-screen, 4 bit planes, 5 foreign languages, local segments, separate dialog/graphics areas
4109	19-inch, 8-color, 4096-color palette	640 x 480	80 x 32, 132 x 32 (7 x 11)	RS232C, Centronics (X-on/X-off, DTR/CTR)	DEC VT52, VT100; Tektronix 4010, 4100, 4110		4 bit planes, RGB video output
CX 4106/ CX 4107	13-inch, 8-color, 64-color palette	640 x 480	80 x 32, 132 x 32 (7 x 11)	RS232C, Centronics (X-on/X-off)	DEC VT52, VT100; IBM 3278, 3279; Tektronix 4010, 4100, 4110		zoom, pan, split-screen, 4 bit planes, RGB video output, separate graphics/dialog areas
CX 4109	19-inch, 8-color, 4096-color palette	640 x 480	80 x 32, 132 x 32 (7 x 11)	RS232C, Centronics (X-on/X-off)	DEC VT52, VT100; IBM 3278, 3279; Tektronix 4010, 4100		4 bit planes
4115B/M4115B	19-inch; red, green, blue; 256-color; 16-million-color palette	1280 x 1024	160 x 64 (7 x 9)	RS232C, DMA interface for DEC VAX	Tektronix 4014		zoom, pan, standard 4 bit planes, dialog area overlay, block mode; opt. curve generation, segment subroutine
TELEX COMPUTER PRODUCTS INC.							
078	12-inch; green, amber		80 x 24 (9 x 12)	RS232C (bisynch, SNA, SDLC)			
079	12-inch, 7-color		80 x 24 (9 x 12)	RS232C (bisynch, SNA, SDLC)			
080	15-inch; green, amber		132 x 27 (7 x 9)	RS232C (bisynch, SNA, SDLC)			
178	12-inch, green		80 x 24 (7 x 12)	RS232C (bisynch, SNA, SDLC)			
179	14-inch, 7-color		80 x 43 (7 x 9)	RS232C (bisynch, SNA, SDLC)			
276	15-inch; green, white		132 x 44 (9 x 14)	RS232C (bisynch, SNA, SDLC)			
278	15-inch, green		132 x 27 (9 x 12)	RS232C (bisynch, SNA, SDLC)			
1186	12-inch; green, amber; 16-color		80 x 25 (7 x 9)	RS232C (bisynch, SNA, SDLC)			
THOMAS ENGINEERING CO.							
TE-780x S	14-inch, green		80 x 24 (7 x 9)	RS232C, current loop (Honeywell VIP)	Honeywell VIP-7814	1,895	
TE-780x V	14-inch, green		80 x 24 (7 x 9)	RS232C, current loop (X-on/X-off)	DEC VT100, Honeywell VIP-7801	1,895	
TRANSIAC CORP.							
TR1024	15-inch, green	1024 x 780	128 x 52	RS232C (X-on/X-off)	DEC VT100, Tektronix 4010, ANSI X3.64	3,750-6,750	scroll, zoom, multiple plotting modes, 4 bit planes, CAMAC-compatible; user-definable character set, rackmount
VG SYSTEMS INC.							
VG 9250	19-inch; green, amber, orange; 16-color; 4096-color palette	1024 x 1024	102 x 68	RS232C, RS449, CCITT V.35 (proprietary)	IBM 3250	26,000	wide line fill, 8 bit planes, supports Japanese Katakana
VG 8250	21-inch; green, amber, orange; 16-color; 4096-color palette	1024 x 1024	102 x 68	RS232C, RS449, CCITT V.35 (proprietary)	IBM 3250	22,000	zoom, pan, digitizer, supports Japanese Katakana, local screen copy

GRAPHICS DISPLAY TERMINALS

TABLE 7

Company Model	Display size (diagonal), color	Display resolution (in pixels)	Alpha mode screen format (matrix character size)	Interfaces (protocols)	Emulations	Unit price (\$)	Notes, features, options
VECTOR AUTOMATION INC.							
Graphicus-80	21-inch, green	4096 x 4096		RS232C, IEEE - 488 (asynch, ASCII)	DEC VT100, Tektronix 4014	18,000-29,000	5,000 characters, Unibus DR11W-compatible; opt. 4096-color
VISUAL TECHNOLOGY INC.							
Visual 102G	14-inch, green	768 x 293	132 x 24 (7 x 9)	RS232C; opt. current loop (X-on/X-off, DTR Busy)	DEC VT52, VT102; Tektronix 4010, 4014; ANSI	1,395	arc, circle/rectangle generation, 1 bit plane
VISUAL 240	14-inch, green, 4-color, 64-color palette	800 x 290	132 x 24 (8 x 10)	RS232C; opt. current loop (X-on/X-off)	DEC VT52, VT100, VT220, VT240; Tektronix 4010, 4014; DEC ReGIS	1,695	arc, circle generation, 2 bit planes
VISUAL 241	13-inch; red, green, blue; 4-color; 64-color palette	800 x 290	132 x 24 (8 x 10)	RS232C; opt. current loop (X-on/X-off)	DEC VT52, VT100, VT220, VT240; Tektronix 4010, 4014; DEC ReGIS	2,195	arc, circle generation, 2 bit planes
Visual 500	14-inch, green	768 x 585	80 x 33 (7 x 11)	RS232C, current loop (X-on/X-off, DTR Busy)	DEC VT52; Data General D200; Lear Siegler ADM-3A; Hazeltine 1500; Tektronix 4010, 4014	1,595	arc, circle/rectangle generation, 1 bit plane
Visual 550	14-inch, green	768 x 585	80 x 33 (7 x 11)	RS232C, current loop (X-on/X-off, DTR Busy)	ANSI X3.64; Tektronix 4010, 4014	1,595	arc, circle, rectangle generation, polygon fill, 1 bit plane

Information was solicited but not received from the following manufacturers:

- Chromatics Inc.
- Control Data Corp.
- Data General Corp.
- Datavue Corp.
- Falco Data Products Inc.
- Grinnell Systems Corp.
- GIXI Inc.
- IBM Corp.
- Industrial Data Terminals Corp.
- Intecolor Corp.
- Jupiter Systems Inc.
- Lear Siegler Inc. (Data Products Div.)
- Memorex Corp.
- Modgraph
- PDS Technologies Inc.
- Phoenix Computer Graphics Inc.
- Ramtek Corp.
- Raster Technologies Inc.
- Scion Corp.
- Soroc Corp.
- Tab Products Co.
- TEC Inc.
- Teleray
- Verticom
- Wicat Systems

For information on their products, consult the Supplementary Manufacturers' Directory of Digest products on Page 110 .

MONITORS

TABLE 8

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (pixels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
AMTRON CORP.							
CD1900	19-inch, infinite colors	standard, long persistence	1280 x 1024	RGB, TTL	60 Hz, non-interlaced	4,000(Q1); 2,900(Q100)	100-MHz bandwidth; cabinet; FCC-, CSA-, UL-approved; opt. anti-glare treatment
AUDIOTRONICS CORP.							
3DD975	3-inch, white	P4, P45; standard	700 x 450	NTSC	60 Hz, interlaced		25-MHz bandwidth, kit form, power 12 VDC
5DD946	5-inch; white, green	P4, P31; standard	650 x 425	NTSC, TTL	60 Hz, interlaced		18-MHz bandwidth, kit/chassis form, power 12 VDC
7DD959	7-inch; white, green	P4, P31; standard	900 x 600	NTSC, TTL	60 Hz, interlaced		20-MHz bandwidth, kit/chassis form, flat-face tube, direct etch, power 12 VDC
7DD969	7-inch, amber	P134, standard	950 x 625	TTL	60 Hz, interlaced		20-MHz bandwidth, flat-face tube, direct etch, power 12 VDC
9DD938	9-inch, white	P4, standard	950 x 625	NTSC, TTL	60 Hz, interlaced		20-MHz bandwidth, kit/chassis form, power 12 VDC; opt. DC restoration
9DD960	5-, 9-inch; amber	P134, standard	700 x 600	TTL	60 Hz, interlaced		25-MHz bandwidth, kit form, power 12 VDC
9DD961	9-inch, white	P4, standard	1000 x 650	TTL	60 Hz, interlaced		20-MHz bandwidth, kit/chassis form, power 12 VDC, P31 available
9DD964	9-inch, green	P31, standard	1000 x 650	TTL	60 Hz, interlaced		20-MHz bandwidth, power 12 VDC, direct etch
12DD955	12-inch; amber, green	P134, P39	1200 x 800	TTL	60 Hz, interlaced		20-MHz bandwidth, power 12 VDC, direct etch
12DD962	12-inch, white	P4, standard	1200 x 800	TTL	60 Hz, interlaced		20-MHz bandwidth, kit/chassis form, power 12 VDC
12DM973	12-inch; amber, green	P134, P31; standard	1200 x 775	NTSC	60 Hz, interlaced		20-MHz bandwidth, cabinet, tilt, swivel, power 120/240 VAC
14CM981	14-inch; 8-, 16-color	P22	720 x 260	TTL	60 Hz, interlaced		18-MHz bandwidth, external brightness, power 120/240 VAC
14CM983	14-inch; 8-, 16-color	P22	640 x 260	TTL	60 Hz, interlaced		18-MHz bandwidth, external brightness, power 120/240 VAC
14DD963	14-inch; amber, green	P134, P31	1300 x 800	TTL	60 Hz, interlaced		20-MHz bandwidth, power 12 VDC
15DD977	15-inch, green	P31, standard	1100 x 800	NTSC, TTL	60 Hz, interlaced		30-MHz bandwidth, external brightness, direct etch, power 120 VAC
15DD979	15-inch, green	P39, standard	850 x 1100	TTL	60 Hz, interlaced		60-MHz bandwidth, external brightness, power 120 VAC
AYDIN CONTROLS							
8810 Patriot	13-inch; 16-color, 4096-color palette	standard, long persistence	640 x 400	RGB, TTL	47 Hz-63 Hz, 70 Hz-80 Hz	1,550(Q1)	25-MHz bandwidth, cabinet; opt. rackmount, contrast/enhancement
8811 Patriot	13-inch; 16-color, 4096-color palette	standard, long persistence	640 x 400	RGB, TTL	47 Hz-63 Hz, 70 Hz-80 Hz	1,550(Q1)	25-MHz bandwidth, cabinet; opt. contrast/enhancement
8815	13-inch, 4096-color palette	standard, long persistence	1024 x 600	RGB	40 Hz-70 Hz	2,350(Q1)	40-MHz bandwidth, cabinet, contrast/enhancement
8830	29-inch; 16-color, 4096-color palette	standard, long persistence	700 x 400	RGB, TTL	47 Hz-63 Hz	1,800(Q1)	25-MHz bandwidth, metal cabinet; opt. rackmount, contrast enhancement
8831	19-inch; 16-color, 4096-color palette	standard, long persistence	700 x 400	RGB, TTL	47 Hz-63 Hz, 70 Hz-80 Hz	1,800(Q1)	25-MHz bandwidth, plastic cabinet; opt. tilt, swivel, contrast/enhancement
8835	19-inch, 4096-color palette	standard, long persistence	1280 x 600	RGB	40 Hz-70 Hz	2,500(Q1)	40-MHz bandwidth, cabinet; opt. rackmount, contrast/enhancement
8836	19-inch, 4096-color palette	standard, long persistence	1280 x 600	RGB	40 Hz-70 Hz	2,500(Q1)	40-MHz bandwidth, cabinet; opt. tilt, swivel, contrast/enhancement
BRIGHT UP INDUSTRIES INC.							
CC1411	14-inch, 16-color	standard		RGB, TTL	50 Hz-60 Hz, interlaced	579(Q1)	FCC-, UL-, CSA-approved; dark glass; cables; opt. swivel base
CC1421	14-inch, 16-color	standard		RGB, TTL	50 Hz-60 Hz	629(Q1)	FCC-, UL-, CSA-approved; dark glass, anti-glare; cable; opt. swivel base

**MONITORS
TABLE 8**

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (pixels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
CC1421-LP	14-inch, 16-color			RGB, TTL	50 Hz-60 Hz, interlaced	689(Q1)	FCC-, UL-, CSA-approved; dark glass, anti-glare; cable; opt. swivel base
CT1403	14-inch	standard		NTSC	50 Hz-60 Hz, interlaced	329(Q1)	FCC-, UL-approved; includes speaker and cable; opt. swivel base
C. ITOH ELECTRONICS INC.							
CIQ-5	5-inch, white	P4, standard	576 x 189	TTL	60 Hz, non-interlaced	185(Q1); 130(Q100)	15-MHz bandwidth, UL-approved, bare chassis
CIQ-9	9-inch, white	P4, standard	720 x 227	TTL	60 Hz, non-interlaced	180(Q1); 125(Q100)	15-MHz bandwidth, bare chassis, tilt
CIQ-9N	9-inch, white	P4	720 x 300	TTL	60 Hz, non-interlaced	180(Q1); 125(Q100)	25-MHz bandwidth; UL-, CSA-approved; bare chassis; tilt
CIQ-12	12-inch, white	P4	720 x 227	TTL	60 Hz, non-interlaced	180(Q1); 125(Q100)	16-MHz bandwidth; UL-, CSA-approved; bare chassis; tilt
CIQ-12N	12-inch, white	P4	720 x 300	TTL	60 Hz, non-interlaced	180(Q1); 125(Q100)	25-MHz bandwidth; UL-, CSA-approved; bare chassis; tilt
CIQ-14N	14-inch, white	P4	720 x 300	TTL	60 Hz, non-interlaced	200(Q1); 145(Q100)	25-MHz bandwidth; UL-, CSA-approved; bare chassis; tilt
CIQ-15V	14-inch, white	P4	720 x 1000	TTL	60 Hz, non-interlaced	900(Q1); 520(Q100)	80-MHz, bare chassis, tilt, half-tone
ICM-14	13-inch; blue, green, red	B22	720 x 374	TTL	60 Hz, non-interlaced	1,150(Q1); 870(Q100)	25-MHz bandwidth, bare chassis, tilt, half-tone; opt. long persistence
CONRAC DIVISION (CONRAC CORP.)							
2400	19-inch, monochrome	P4, standard	1280 x 960		60 Hz, interlaced	2,900(Q1)	
2600	9-, 15-, 19-inch; monochrome	P4, standard			60 Hz, interlaced		
5211	25-inch, color	P22, standard	540 x 483	RGB	60 Hz, interlaced	5,065(Q1)	
7000	9-inch, 8-color	P22, standard	440 x 330	TTL	60 Hz; interlaced, non-interlaced	665(Q1)	
7000	13-inch, 8-color	P22, standard	720 x 560	TTL	60 Hz; interlaced, non-interlaced	865(Q1)	
7000	19-inch, 8-color	P22, standard	900 x 675	TTL	60 Hz; interlaced, non-interlaced	1,495(Q1)	
7111	19-inch, color	P22, standard	1024 x 768	RGB	60 Hz; interlaced, non-interlaced	2,360(Q1)	opt. anti-glare screen
7211	13-, 19-inch; color	P22, standard	921 x 739/ 1080 x 809	RGB	60 Hz; interlaced, non-interlaced	3,590(Q1); 3,859(Q1)	
7311	19-inch, color	P22, standard	1280 x 1024	RGB	60 Hz, non-interlaced	4,325(Q1)	opt. direct etch
QQA	15-, 17-, 21-inch, monochrome	P4, standard			60 Hz, interlaced	3,260(Q1); 3,745(Q1); 4,395(Q1)	
DATACOPY							
500 High Resolution Display	15-inch, white	P40, long persistence	1728 x 2200	ECL	30 Hz, interlaced	17,950(Q1)	requires computer interfaces: IBM PC (Model 112), Multibus (Model 220), Q-bus (Model 230), HP GPIO (Model 240)
DYNAX INC.							
AM30/GM30	12-inch	P4A, P31				199(Q1)	200-MHz bandwidth
FC10	13-inch		640 x 200	NTSC		599(Q1)	30-MHz bandwidth, mono-mode switch
ELECTROHOME LTD.							
ECM 1301	13-inch, color	long persistence	720 x 512	RGB	interlaced		
EVM Series	9-, 12-, 15-, 17-, 23-inch; monochrome	P4, P39, P31		NTSC		571-939(Q1)	
IKEGAMI ELECTRONICS (USA) INC.							
CDA 143H	14-inch, color	P22, standard	1024 x 512	RGB	60 Hz, non-interlaced	1,989(Q1); 1,890(Q100)	40-MHz bandwidth; FCC-, CSA-, UL-, IEC-approved

MONITORS

**MONITORS
TABLE 8**

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (pixels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
CDA 203HLA	20-inch, color	standard, long persistence	1280 x 1024	RGB	30 Hz, interlaced	2,690(Q1); 2,421(Q100)	40-MHz bandwidth; FCC-, CSA-, UL-, IEC-approved
CDB 143H	14-inch, 27-color	P22, standard	1024 x 512	TTL	60 Hz, non-interlaced	1,442(Q1); 1,370(Q100)	40-MHz bandwidth; FCC-, CSA-, UL-, IEC-approved
DM 2050	20-inch, color	standard	1280 x 1024	RGB	60 Hz, non-interlaced	4,175(Q1); 3,500(Q100)	100-MHz bandwidth; FCC-, CSA-, UL-, IEC-approved
INFORMATION PERIPHERALS CORP. (INFOPERC)							
DC-1453	12-, 13-inch	standard, long persistence	720 x 420	TTL	60 Hz, non-interlaced	900(Q1); 750(Q100)	
CD-1552	12-, 13-inch; 8-color	standard, long persistence	720 x 240	TTL	60 Hz, non-interlaced	900(Q1); 750(Q100)	
MICROTOUCH SYSTEMS INC.							
Point-1 Color	13-inch, 16-color		640 x 400	RGB	50 Hz-60 Hz	1,895(Q1); 1,395(Q100)	RS232C interface
Point-1 Monitor	12-inch; amber, green			NTSC, TTL	50 Hz	1,495(Q1); 495(Q100)	RS232C interface
MICROVITEC INC.							
1496/DI2U	14-inch, 16-color	standard	653 x 585	TTL	45 Hz-65 Hz; interlaced, non-interlaced	575(Q1)	18-MHz bandwidth, FCC approved, dark glass, cabinet, IBM PC-compatible
14L86/DI2U	14-inch, 16-color	long persistence	895 x 585	TTL	45 Hz-65 Hz, interlaced	895(Q1)	18-MHz bandwidth, FCC-approved, dark glass, cabinet, IBM PC-compatible
MITSUBISHI ELECTRONICS AMERICA INC.							
AT1332A	13-inch, 16-color	standard	640 x 240	TTL	60 Hz		15-MHz bandwidth, cabinet
C3419	13-inch, infinite colors	standard	720 x 540	RGB	50 Hz-60 Hz		20-MHz bandwidth, cabinet or rackmount
C3470	13-inch, infinite colors	standard	720 x 540	RGB	40 Hz-70 Hz		25-MHz bandwidth, cabinet
C3479	13-inch, infinite colors	standard	720 x 540	RGB	50 Hz-60 Hz		40-MHz bandwidth, cabinet
C3919	19-inch, infinite colors	standard	760 x 400	RGB	40 Hz-70 Hz		25-MHz bandwidth, cabinet or rackmount
C3920	19-inch, infinite colors	standard	760 x 400	RGB	40 Hz-70 Hz		25-MHz bandwidth, opt. cabinet
C3950	19-inch, infinite colors	standard	800 x 600	RGB	40 Hz-70 Hz		opt. cabinet
C5950	19-inch, infinite colors	standard	1024 x 780	RGB	40 Hz-70 Hz		opt. cabinet
C6479	13-inch, infinite colors	standard	720 x 560	RGB	40 Hz-70 Hz		40-MHz bandwidth, cabinet or rackmount
MONITERM							
VR Series	15-, 17-, 19-inch; amber, b&w, green, orange	standard, long persistence	1024 x 1280	TTL	60 Hz-70 Hz; interlaced, non-interlaced		
MOTOROLA DISPLAY SYSTEMS							
CM/CH4000 Series	14-inch; blue, green, red, white		720 x 480	RGB	47 Hz-63 Hz, interlaced		22-MHz bandwidth, opt. anti-glare treatment
DS4000/3000 Series	12-, 15-inch; green, white	P4, P31, P39	950 x 380	TTL	47 Hz-63 Hz, non-interlaced		power 110/220 VAC
HS4000/3000 Series	12-, 15-inch; green, white	P4, P31, P39	1050 x 512	TTL	47 Hz-63 Hz, non-interlaced		dark glass, acid etch
L40000 Series	15-inch; green, white	P4, P104, P31; standard	1024 x 1024	TTL	50 Hz-90 Hz, non-interlaced		100-MHz bandwidth, power 85-264 VAC
MD1000/1400 Series	5-inch; green, white	P4, P31	500 x 240	TTL	47 Hz-63 Hz, non-interlaced		kit/chassis form, power 12 VDC
MD1500/1700 Series	7-inch; green, white	P4, P31; standard	650 x 290	TTL	47 Hz-63 Hz, non-interlaced		22-MHz bandwidth, kit/chassis form, power 12 VDC

**MONITORS
TABLE 8**

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (dpi/pels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
MD2000/2800 Series	9-inch; green, white	P4, P31; standard	650 x 290	TTL	47 Hz-63 Hz, non-interlaced		22-MHz bandwidth, kit/chassis form, power 12 VDC
MD3570/3970 Series	12-inch; green, white	P4, P31, P39	800 x 320	TTL	47 Hz-63 Hz, non-interlaced		25-MHz bandwidth, kit/chassis, power 12 VDC
S40000 Series	15-inch, green	P39, long persistence	1024 x 1024	TTL	50 Hz-90 Hz, interlaced		50-MHz bandwidth, power 85-264 VAC
NEC HOME ELECTRONICS (U.S.A.) INC. (PERSONAL COMPUTER DIV.)							
JC-1215A	12-inch, 8-color	standard		NTSC	60 Hz, interlaced	399(Q1)	
JC-1216 DFA	12-inch, 16-color	standard	640 x 240	RGB	60 Hz	599(Q1)	
JC-1410P2A	14-inch, 16-color	standard	640 x 400	RGB	56.4 Hz, interlaced	998(Q1)	30-MHz bandwidth
JC-1460DA	14-inch, 16-color	standard	500 x 240	RGB	60 Hz	499(Q1)	
PANASONIC CO. LTD.							
CT-1111 D	10-inch, color	standard		NTSC	interlaced	369(Q1)	
CT-3173 M	13-inch, 16-color	standard	40 x 25	RGB, TTL	non-interlaced	469(Q1)	
CT-9072 M	19-inch, color	standard		NTSC	interlaced	619(Q1)	
CTF-1394 M	13-inch, color	standard	40 x 25	NTSC	interlaced	419(Q1)	
CTF-1495 M	14-inch, 16-color	standard	80 x 25	RGB, TTL	non-interlaced	499(Q1)	
CTF-2095 M	20-inch, 16-color	standard	80 x 25	RGB, TTL	non-interlaced	510(Q1)	
PANASONIC INDUSTRIAL CO. (DIV. OF MATSUSHITA ELECTRIC CORP. OF AMERICA)							
BT-P4500D	45-inch, 16-color	P1	640 x 240	RGB, NTSC, TTL	60 Hz; interlaced, non-interlaced	4,995(Q1)	FCC Class B-, UL-approved; non-glare screen; swivel stand
DT-D1300D	13-inch, 16-color	P22, standard	580 x 240	NTSC, TTL	60 Hz; interlaced, non-interlaced	499(Q1)	direct etch, non-glare screen
DT-H103	10-inch, 16-color	P22, standard	640 x 240		60 Hz, non-interlaced		non-glare screen, swivel stand
DT-M140	14-inch, 16-color	P22, standard	660 x 240	RGB, NTSC, TTL	60 Hz; interlaced, non-interlaced	699(Q1)	dark glass, non-glare screen
DT-S101	10-inch, 16-color	P22, standard		NTSC	60 Hz, interlaced	339(Q1)	dual mode
TR-120M1PA	12-inch, green	P31, standard		NTSC	60 Hz, non-interlaced	219(Q1)	direct etch, non-glare screen, opt. swivel stand
TR-120MDPA	12-inch, amber	standard		NTSC	60 Hz, non-interlaced	239(Q1)	direct etch, non-glare screen, opt. swivel stand
TR-122M9P	12-inch, green	P39, long persistence		TTL	49.55 Hz, interlaced	249(Q1)	FCC Class B-, UL-approved; direct etch; non-glare screen
TR-122MYP	12-inch, yellow	long persistence		TTL	49.55 Hz, interlaced	259(Q1)	FCC Class B-, UL-approved; opt. direct etch; non-glare screen
TX-12H3P	12-inch, 16-color	P22, standard	640 x 240	TTL	60 Hz, interlaced	699(Q1)	FCC Class B-, UL-approved; non-glare screen; swivel stand
PRINCETON GRAPHIC SYSTEMS							
HX-9	9-inch, 756-color	standard	690 x 240	TTL	non-interlaced	750(Q1)	IBM-compatible, built-in green/amber switch
HX-9E	9-inch; 16-, 64-color	standard	640 x 240, 640 x 350	TTL	non-interlaced	650(Q1)	Apple-, IBM-compatible
HX-12	12-inch, 16-color	standard	690 x 240	RGB, TTL	60 Hz, non-interlaced	699(Q1)	15-MHz bandwidth; rackmount; cabinet; FCC Class B-, UL-approved; anti-glare treatment
HX-12E	12-inch; 16-, 64-color	P22, standard	690 x 240, 690 x 350	RGB, TTL	non-interlaced	785(Q1)	anti-glare treatment

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**MONITORS
TABLE 8**

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (p/pxels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
MAX-12	12-inch, amber	PC134, standard	720 x 350, 640 x 200	RGB, TTL	50 Hz-60 Hz, non-interlaced	249(Q1)	23-MHz bandwidth; rackmount; cabinet; FCC Class B-, UL-approved; anti-glare treatment
SR-12	12-inch, 16-color	standard	690 x 400	RGB, TTL	60 Hz, non-interlaced	799(Q1)	30-MHz bandwidth, rackmount, FCC Class B approved
SR-12P	12-inch, 4096-color palette	standard	690 x 480	RGB	non-interlaced	999(Q1)	anti-glare treatment
QUADRAM CORP.							
Amber-chrome	12-inch; amber, monochrome	P134, standard	720 x 350	TTL	50 Hz, non-interlaced	250(Q1)	dark glass, anti-glare tube, cable, manual
Quad-chrome I	12-inch, 16-color	P3	690 x 240	TTL	60 Hz, non-interlaced	695(Q1)	FCC-, UL-approved; cable, manual
Quad-chrome II	14-inch, 16-color	P134, standard	640 x 240	TTL	60 Hz, non-interlaced	599(Q1)	cable, manual
Quad-screen	17-inch; b&w, monochrome	P4, long persistence	968 x 512	TTL	60 Hz, non-interlaced	1,995(Q1)	cable, software, controller
SHARP ELECTRONICS CORP.							
12M-15BU	12-inch, green	P31	640 x 200	NTSC	60 Hz, non-interlaced	155(Q1)	non-glare screen
12M-15BUA	12-inch, amber	PDB	640 x 200	NTSC	60 Hz, non-interlaced	165(Q1)	non-glare screen
12M-22U	12-inch, 16-color	P22	640 x 200	RGB	60 Hz, non-interlaced	569(Q1)	non-glare screen
13M-31U	13-inch, 8-color	P22	280 x 350	NTSC	60 Hz, non-interlaced	339(Q1)	audio jack
SYSTEMS RESEARCH LABORATORIES INC.							
2106	13-, 19-inch; user-definable colors	P22; standard, long persistence	1280 x 1024	RGB, TTL	25 Hz-90 Hz		100-MHz bandwidth, rackmount, select-a-rate
2110	19-inch, user-definable colors	P22, standard	1280 x 1024	RGB, TTL	25 Hz-90 Hz		100-MHz bandwidth, rackmount, select-a-rate
TAXAN CORP.							
115	12-inch, green	P39, long persistence	640 x 200	NTSC	60 Hz, non-interlaced	169(Q1)	20-MHz bandwidth; plastic cabinet; FCC Class B-, UL-, CSA-approved
116	12-inch, amber	PUL, long persistence	640 x 200	NTSC	60 Hz, non-interlaced	179(Q1)	20-MHz bandwidth; plastic cabinet; FCC Class B-, UL-, CSA-approved
121	12-inch, green	P39, long persistence	640 x 350	TTL	50 Hz, non-interlaced	189(Q1)	20-MHz bandwidth; plastic cabinet; FCC-, UL-, CSA-approved
122	12-inch, amber	PUL, long persistence	640 x 350	TTL	50 Hz, non-interlaced	199(Q1)	20-MHz bandwidth; plastic cabinet; FCC-, UL-, CSA-approved
410	12-inch; 16-, 4096-color	B22, standard	510 x 200	RGB, TTL	60 Hz, non-interlaced	469(Q1)	15-MHz bandwidth; FCC Class B-, UL-approved
411	12-inch, 16-color	B22, standard	510 x 200	TTL	60 Hz, non-interlaced	499(Q1)	15-MHz bandwidth; FCC Class B-, UL-approved
420	12-inch; 16-, 4096-color	B22, standard	640 x 200	RGB, TTL	60 Hz, non-interlaced	579(Q1)	18-MHz bandwidth; FCC Class B-, UL-approved
420L	12-inch; 16-, 4096-color	B22, long persistence	640 x 400	RGB, TTL	60 Hz, interlaced	579(Q1)	18-MHz bandwidth; FCC Class B, UL-approved
425	12-inch, 16-color	B22, standard	640 x 200	TTL	60 Hz, non-interlaced	609(Q1)	18-MHz bandwidth; FCC Class B-, UL-approved
440	12-inch, 16-color	B22	640 x 400	TTL	60 Hz, non-interlaced	799(Q1)	22-MHz bandwidth; FCC Class B-, UL-approved
TECHLAND SYSTEMS INC.							
Cub	14-inch, green	long persistence	895 x 585	RGB	60 Hz; interlaced, non-interlaced	845(Q1)	15-MHz bandwidth, rackmount
TEKNIKA ELECTRONICS CORP.							
MJ-10	13-inch, 16-color	P22, standard	400 x 240	NTSC	60 Hz, non-interlaced	299(Q1)	FCC-, UL-, CSA-approved
MJ-22	13-inch; 16-color, 32-color palette	P22, standard	506 x 240	NTSC, TTL	60 Hz, non-interlaced	499(Q1)	FCC-, UL-, CSA-approved
TEKTRONIX INC.							
GMA 201	19-inch, white	P4, standard	1336 x 2048	NTSC	60 Hz, non-interlaced	3,675(Q1); 2,830(Q100)	200-MHz bandwidth; rackmount; UL-, CSA-approved; opt. cabinet

**MONITORS
TABLE 8**

Company Model	Display size (diagonal), color	Phosphor number	Display resolution (pixels)	Input signals	Vertical refresh (Hz)	Price (\$)	Notes, features, options
GMA 301	19-inch, color	P22, standard	480 x 640	RGB	60 Hz, non-interlaced	4,020(Q1); 3,095(Q100)	30-MHz bandwidth; rackmount; UL-, CSA-approved; opt. cabinet
GMA 302	19-inch, color	P22, standard	768 x 1024	RGB	60 Hz, non-interlaced	3,675(Q1); 2,830(Q100)	60-MHz bandwidth; rackmount; UL-, CSA-approved; opt. cabinet
GMA 303	19-inch, color	P22, standard	1024 x 1280	RGB	60 Hz, non-interlaced	4,345(Q1); 3,346(Q100)	90-MHz bandwidth; rackmount; UL-, CSA-approved; opt. cabinet
GMA 304	19-inch, color	standard	1024 x 1280	RGB	60 Hz, non-interlaced	9,240(Q1); 7,115(Q100)	90-MHz bandwidth; rackmount, UL-, CSA-approved; opt. cabinet
ZENITH RADIO CORP. (COMPONENTS & SYSTEMS GROUP)							
Custom Color Displays	9-, 12-, 13-, 19-, 25-inch; color						designed to customer specifications
Custom Monochrome Displays	5-, 7-, 9-, 12-, 14-, 15-inch; monochrome						designed to customer specifications
XTRON COMPUTER EQUIPMENT CORP.							
AA12X	12-inch, amber	P134/H10, standard		NTSC	60 Hz; interlaced, non-interlaced	129(Q1)	FCC approved, 4-way tilt and swivel base, dark glass
AG12X	12-inch, green	P31, standard		NTSC	60 Hz; interlaced, non-interlaced		
IA12X	12-inch, amber	P8, standard		TTL	60 Hz, interlaced	169(Q1)	FCC approved, 4-way tilt and swivel base, dark glass
IG12X	12-inch, green	P39, standard		TTL	60 Hz, interlaced		
Comcolor I	14-inch, 8-color	P22		NTSC	60 Hz, non-interlaced	229(Q1)	FCC-, UL-approved; built-in audio speaker

Information was solicited but not received from the following manufacturers:

- Algol Technology Inc.
- Amdek Corp.
- Ball Electronics Displays
- Barco Industries Inc.
- Comrex International
- Dotronix Inc.
- Elector USA
- Emulex/Prsyst
- Hitachi Densi
- Hitachi Corp. of America Ltd.
- IBM Corp. (Entry Systems Div.)
- Industrial Data Terminals Corp.
- KSI (Kawa Systems International)
- Leading Edge Products Inc.
- Micro Display Systems
- Monitron Corp.
- Nissei Sangyo Corp. (NSA Inc.)
- Saber Technology Corp.
- Sakata USA
- Samsung Electronics America Inc.
- Sanyo Electric Inc.
- Sigma Design
- Sony Corp. of America
- Sumitronics Inc.
- Tatung Co. of America
- Toshiba America Inc.
- Video Monitors Inc.
- Vidstar Inc.

For information on their products, consult the Supplementary Manufacturers' Directory of Digest Products on Page 110