

All About CRT Display Terminals

In less than a decade, the CRT display terminal has become almost as commonplace as the ubiquitous teletypewriter and has found its way into innumerable applications. When first introduced as a computer input/output unit, the CRT terminal found limited acceptance because of its high cost. But with the rapid advances in electronics technology, prices have steadily declined, and some CRT terminals with limited capabilities are now less expensive than teletypewriter terminals.

Today's market offers a broad variety of CRT terminals, ranging from the so-called "dumb" terminals with rock-bottom prices of less than \$75 per month to programmable units ranging upward from several hundred dollars per month. Some of the more sophisticated terminals are built around minicomputers with as much as 32K bytes of memory, are supported by stored programs, and offer a host of peripheral devices including disk and tape drives, diskette and cassette drives, printers, card readers, and punched tape readers and punches. These terminals are actually small computer systems designed to function in a distributed processing environment.

Alphanumeric display terminals, which are designed mainly to display messages composed of alphanumeric characters, are attracting most of the attention and generating most of the revenue in the CRT display field these days. Graphic CRT terminals account for only a small portion of the overall market. Therefore, the emphasis throughout this report is on the alphanumeric terminals.

Since 1965, when the first commercially available CRT display terminals were introduced, dozens of CRT terminal manufacturers have appeared on the scene. Many have already stumbled and fallen by the wayside; others have survived to become today's major CRT terminal makers. Still others seek a place in the crowded display terminal market that is already amply supplied by leading main-frame manufacturers and by large independents such as Hazeltine and Sanders. All these companies, new and old, obviously believe that a vast market exists for CRT terminals.

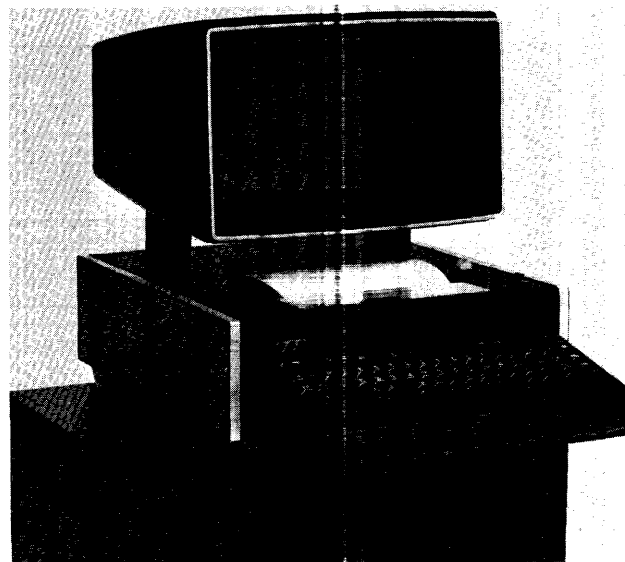
What is the nature of this market? To what extent have the CRT terminals impacted computer users? Do they represent a panacea for all computer input/output problems? What do their users think of them? Should you be using them? And if so, which of the many available models represents the best overall choice for you? This report attempts to answer these questions by clearly and comprehensively describing the characteristics of today's CRT terminals and their role in the data communications field. The current offerings of 65 manufacturers are summarized in the accompanying comparison charts, and the experience of 268 users with 7,858 CRT terminals is reported in clearcut tabular form.

This comprehensive report summarizes the characteristics of 162 CRT display terminals from 65 suppliers, presents the results of an extensive user survey covering more than 7,800 installed terminals, and provides practical guidelines for selecting a terminal that will meet your specific needs.

THE TERMINAL MARKET

The communications terminal market should continue to expand at a rapid rate over the next decade, accompanied by a significant reduction in the number of competing manufacturers. Over 7 million terminals having a cumulative value of about \$40 billion are expected to be delivered during the next decade. The installed base of 700,000 terminals of all types in 1972 is expected to increase to an estimated 4.7 million terminals by 1982. But what share of this vast market belongs to the interactive CRT terminals, and how does its projected growth rate compare with that of the overall terminal market?

Over 200,000 CRT terminals are believed to be in use today, which means that they comprise roughly 30 percent of the total terminal market. The installed base is expected to exceed 800,000 CRT terminals by 1982, with ▷



The biggest news event of 1973 in the CRT terminal field was the unveiling of the Teletype Model 40, also available from the Bell System as Dataspeed 40. Priced from \$2,995 to \$5,610, the Model 40 is offered in several physical configurations, including this pedestal unit with integral printer. The terminal features a 1920-character screen, advanced diagnostic capabilities, and an impact printer rated at 220 to 314 lines per minute.

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▷ deliveries increasing from about 43,000 units valued at \$200 million in 1973 to 400,000 units valued at \$1.6 billion in 1982.

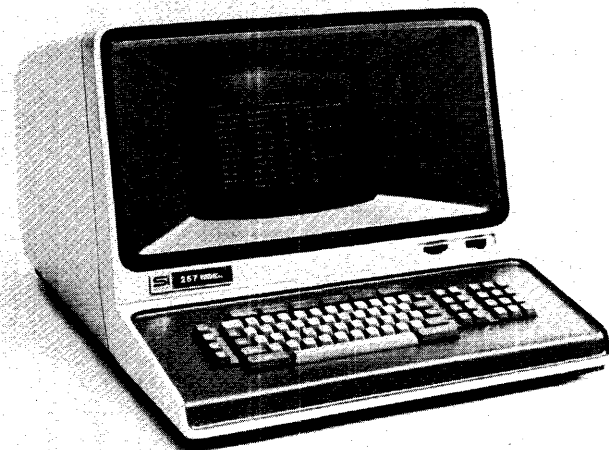
IBM is the largest single supplier, with an estimated 49 percent of the market, though its leadership in the CRT terminal market is substantially lower than its 70 percent share of the large-scale mainframe market. IBM's current market thrust, spearheaded by the 3270 Information Display System and a relatively new entry, the 3790 Communication System, is expected to raise its market share to about 53 percent over the next three years. IBM's dominant influence in the CRT terminal market is expected to increase the market share of the IBM-compatible CRT suppliers, now holding an estimated 17 percent of the market, to 20 percent by 1977, while the total market share of the non-IBM-compatible suppliers is expected to plunge from 34 to 27 percent.

THE CRT TERMINAL INDUSTRY

Excluding specialized terminals for dedicated markets such as brokerage houses and financial firms, the CRT terminal industry has focused its attention on four principal markets: Teletype replacement, IBM 3270 and 2260 replacement, programmable terminals, and graphic terminals.

The most active of these four markets has been, and will probably continue to be, that of Teletype replacement, because it represents the greatest profit potential for the small terminal manufacturers.

Replacements for the IBM 2260 have reached their peak of market penetration and are now offered by most



The Sycor 250, an IBM 3270 replacement, is available in a remote stand-alone or cluster configuration, features screen sizes of 480 or 1920 characters, and provides user-programmable validation checking on entered data. Up to 32 of the Model 257 display units shown here can be connected to a remote controller.

independents on an "as available" basis. The IBM replacement industry has now directed its attention to 3270 replacements.

Programmable terminals promise to capture both the older IBM 2260 and newer IBM 3270 replacement markets by virtue of their software emulation capability. The key marketing advantage of the programmable terminals is their capability to emulate virtually any terminal through microprogram control. These versatile terminals are thus less vulnerable to obsolescence.

The graphic terminal market is dwarfed by comparison to the huge alphanumeric terminal market. Graphic terminals in general provide a full graphics capability such as vector generation, point-addressable matrix, etc., but also provide an alphanumeric capability for messages or labeling.

IBM'S BEST-SELLER, THE 3270

The IBM 3270 has strongly impacted the CRT terminal market since deliveries began late in 1971. Representing a significant price/performance improvement over its forerunner, the IBM 2260, the 3270 is carving a sizeable slice of the marketplace. Priced well below the 2260, the 3270 features expanded functional capabilities, such as twice the display capacity of the 2260 and increased transmission and printing speeds. It also provides sophisticated operating capabilities, such as program-controlled formatting, program function keys, and more sophisticated commands. But the 3270 is not a direct replacement for the 2260. Thus, IBM computer users must consider fairly extensive software conversions in order to switch from the 2260 to the 3270.

Recognizing the complexity involved in replacing existing 2260 installations with 3270's, the independents introduced attractive alternatives — 2260 replacement terminals that provide compatibility with existing 2260 operating software but offer 3270-like features, such as a large screen size, flexible cluster configurations that can accommodate multiple printers, faster printers, editing capabilities, increased transmission speeds, etc., all at substantial cost savings over the prices of either the IBM 2260 or 3270 displays. The more prominent of these independents are Courier, Delta Data Systems, GTEIS, ITT, and Trivex. Meanwhile, these and other independents began to direct their attention to the development of 3270 replacement terminals.

IBM discouraged the continued use of the 2260 by not supporting it under new communications software packages such as the Network Control Program (NCP), used with the new 3704 and 3705 Communications Controllers, and VTAM, the principal access method for telecommunications support under DOS/VS and OS/VS, when these facilities were announced. However, both the 3704 and 3705 Communications Controllers continue ▷

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➤ support for the 2260 under the Emulation Program, which furnishes the capability of a 270X hard-wired controller. There are also indications that IBM will insert support for 2260's under the full System/370 operating software. Although IBM is clearly directing its support away from the System/360 market, the independents are determined to keep it alive. UNIVAC's introduction of the 3760 Communications Controller is a typical example. A direct replacement for the IBM 3704 and 3705, the UNIVAC 3760 bears greatest significance to System/360 users, for whom it provides System/370-like capabilities for handling true front-end communications processing.

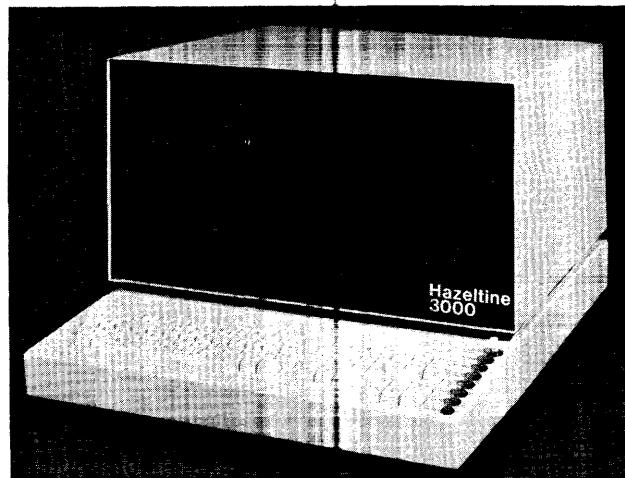
During the past year, a number of independent manufacturers have introduced direct replacements for IBM's 3270 Information Display System. Among these are Computer Optics, Courier, Four-Phase Systems, GTEIS, Incoterm, Raytheon, Sanders, and Sycor. Still others will enter the market in the coming months. As one might expect, the independents are offering more than just substantial price reductions. Enhancements include additional screen sizes, increased configuration flexibility, greater printing capabilities, data validation via user programs, display enhancements, etc. Not all these enhancements are offered for the same terminal, so users should examine each product separately for those characteristics that satisfy the needs of their specific applications.

IBM IN RETROSPECT

IBM announced its intention to enter the CRT terminal market during the early years and in 1966 introduced the 2260 Display Station, a clustered terminal accommodating as many as 24 individual CRT displays that could be used at the central computer site or at a remote site via a communications facility. With its introduction of the 2260, IBM placed its stamp of approval on CRT display terminals as a practical medium for data entry and set the stage for a viable CRT terminal industry by establishing the initial parameters.

Because IBM has long dominated the computer industry, it follows that IBM should also dominate the CRT terminal industry. It does. IBM followed the 2260 in 1967 by introducing a single-tube version, the 2265, which was designed for communications only. Since both terminals communicate with the IBM System/360 computers and are supported by IBM software, their growth has been generally proportional to the increasing number of System/360 installations. The 2260 and 2265 reigned as IBM's sole display terminals until mid-1971, when IBM announced its 3270 Information Display System as a more sophisticated and less expensive replacement.

The principal weaknesses of the IBM 2260 and 2265 are small display capacity, lack of an editing capability, a rather crude and inflexible fixed-format capability, a very limited hard-copy capability, and last, but by no means least, high unit cost. Products of vacuum-tube technology,



New on the market, the Teletype-compatible Hazeltine 3000 features microprogrammed operation, a big 1998-character screen, a separate numeric keygroup, editing functions, and transmission speeds to 9600 bps—all at a price tag of less than \$4,000.

the IBM 2260 and 2265 are now clearly obsolescent though still widely used. As display terminals produced by other terminal makers became more sophisticated, reflected by the advancing state of the art, the IBM terminals began to look conspicuously dated.

ENTER THE INDEPENDENTS

It did not take the independent manufacturers long to recognize the fact that a ripe replacement market existed. Several companies began to produce and market CRT display terminals designed to replace the IBM 2260 and 2265 displays at substantial dollar savings. Most featured enhancements such as larger display capacities, edit and format handling features, provision for handling several printers operating in local and/or remote modes, and other noteworthy capabilities. Most of these enhancements require some alterations to the IBM communications software, but these can generally be implemented by a minor partial sysgen to write the new operating parameters.

Producing a cheaper and better substitute for IBM's display terminals became easier as time passed as a direct result of large-scale integration, the use of semiconductor memories, and the infusion of low-priced keyboards. However, all is not sunshine and roses; early installations of IBM-replacement displays have frequently experienced lengthy debugging periods during which all kinds of problems arose, ranging from simple to complex. In some cases, hardware proved to be unreliable; in others, timing problems existed. The former may be resolved by component changes; the latter may require more extensive changes because they involve the timing of the exchange of information and commands between computer and display terminal. Datapro has found, as a result of con-

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➤ versions with many users, that during the installation and debugging period, a good many of the independent manufacturers are showing a high degree of overall competence and are quick to respond to the users' needs.

THE TELETYPE REPLACEMENT MARKET

While some of the independents pursued the IBM replacement market, others chose to take on Teletype. This is by no means an easy task when you stop to consider that the outright purchase price of a Teletype Model 33 ASR is less than \$1,000 and that a KSR costs about half as much. But the independents were offering more than just a CRT in place of a printer. The Model 33, as you probably know, is a limited-usage machine, supposedly good for about four hours per day. Its heavy-duty equivalent, the Model 35, carries a price tag about three times as high. Both machines provide limited transmission rates of 10 characters per second. And what about paper tape? It's cheap but crude compared with the use of magnetic tape cassettes. These limitations provide the prime incentives for teletypewriter replacement.

CRT terminals can compete with the price of the Teletype Model 35 and provide the kind of equipment reliability required for continuous usage by virtue of the use of electronic components. In addition, CRT terminals can offer transmission speeds that are limited only by the inherent capacity restraints of the communications facility. Many of the Teletype-compatible CRT terminals offer a range of switch-selectable speeds from 10 to 240 characters per second. Other features, such as an edit capability and the transmission of message blocks, can be considered as gravy. To satisfy specific user needs, such as occasional printed output and a recording medium for on- or off-line operation, many vendors supply low-priced, nonimpact printers and magnetic tape cassette recorders.

TELETYPE REACTS

While the independent CRT manufacturers were busy replacing Teletype terminals, Teletype Corporation witnessed steadily declining revenues — a strong impetus that forced Teletype to change its image from that of an old-line supplier of low-speed, message-oriented equipment to that of a sophisticated terminal manufacturer. Though long dedicated to the production of teleprinters and punched tape equipment, Teletype gained experience with CRT terminals in the late 1960's, when development began on communication display terminals for AT&T in-house applications such as order entry.

Teletype's impressive new communications terminal, the Model 40, was unveiled in May 1973. The unit was offered on a purchase-only basis by Teletype, a subsidiary of AT&T's Western Electric Company, and as the Dataspeed 40 Service, a tariffed service offered by AT&T and its Bell System operating companies.

The joint introduction of the Teletype Model 40 and AT&T Dataspeed 40 Service spread waves of apprehension that penetrated the very foundation of the communications terminal industry, largely composed of small, independent manufacturers. The Model 40 offers an impressive collection of capabilities and features at very competitive prices. With AT&T's backing, it can be expected to have a major impact upon the already-crowded CRT terminal market. Industry analysts have raised the possibility that Teletype and IBM may run up against one another, with the two giants competing for the large corporate customers who will be merging their data and message networks. Although a year has passed since the introduction of the Model 40, the market will not witness the predicted impact in the near future. Delivery of the Model 40 has just begun, and the initial deliveries have been and will continue to be primarily to AT&T.

The Model 40 is a family of interactive terminal modules that can be arranged in various configurations ranging from a receive-only printer to a full-blown terminal including keyboard, display, and printer. Four modules form the basic building blocks of the Model 40: keyboard display, printer, and terminal logic. The unit features MOS construction and boasts a self-diagnostic capability that will serve as a powerful aid to the user for quickly locating a faulty component through visual inspection.

The Model 40 is not designed, nor intended, as a direct replacement for Teletype teletypewriters. Although the Model 40 Display/printer Terminal and the Model 33 and 35 teletypewriters exhibit partial transmission compatibility (both are asynchronous ASCII devices), they differ greatly in transmission speed. The Model 40 is a medium-speed terminal, while Models 33 and 35 are low-speed terminals. However, the Model 40 can communicate with Models 33 and 35 via the Teletype 4210 Magnetic Tape Terminal, which can act as a buffer.

The Model 40 is basically transmission-compatible with existing communications software that supports other medium-speed asynchronous ASCII terminals, but the special features provided by the Model 40 must be user-implemented via modifications to existing applications software. IBM currently does not provide support for this breed of terminals as a standard feature for any of its 270X or 370X communications controllers. If the market for medium-speed terminals gobbles up the Model 40 as rapidly as it can be produced, as Teletype anticipates, user pressure may eventually lead to IBM support—but not without IBM's full awareness that the Teletype Model 40 could severely impact its own 3270 market.

USER EXPERIENCE

To assess the current level of user satisfaction with CRT display terminals, and to determine the patterns of usage ➤

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of these terminals, Datapro conducted an extensive user survey. A CRT Display Reader Survey Form was included in the January 1974 supplement to DATAPRO 70 and mailed to all subscribers. By March 1, usable responses had been received from a total of 268 users with a total of 7,858 installed display stations.

Because some users reported on more than one model of display, the user replies generated a total of 394 responses or individual equipment ratings and profiles. The orientation of the users participating in the survey can be shown by the following table:

Responses on:	Responses		Displays	
	Number	Percent	Number	Percent
IBM displays	141	35.8	2,810	35.7
Other displays	253	64.2	5,048	64.3
Total	394		7,858	

Overall, the average number of displays per response was 20.0, while the average number of displays per responding user was 29.4.

Users were asked to rate the overall performance, ease of operation, hardware reliability, maintenance service, and software and technical support for each display by assigning a rating of excellent, good, fair, or poor. The resulting ratings for 40 popular display models or families are summarized in Table I. Prospective buyers should note that the small sample sizes for some of these models make it unwise to draw firm conclusions from the indicated ratings.

To put the raw counts into a form more readily grasped, Datapro calculated a weighted average for each rating category. Each user response was assigned a weight of one, and the ratings were weighted on the conventional scale of 4, 3, 2, and 1 for excellent, good, fair, and poor, respectively. There is no inherent "correctness" to this weighting scheme, any more than to the ratio of scales selected to make a graphic presentation. The data is presented as an additional, useful information source, not as the final word on the worth of the displays represented.

The ratings assigned by the responding users can also be combined to form an overall picture of current user satisfaction with the IBM displays, other manufacturers' displays, and all displays:

	Excellent	Good	Fair	Poor
IBM Displays				
Overall performance	36%	57%	7%	0%
Ease of operation	37	56	6	1

	Excellent	Good	Fair	Poor
Hardware reliability	31	50	18	1
Maintenance service	34	50	16	0
Software & technical support	16	42	34	8

Other Displays

Overall performance	38%	51%	9%	2%
Ease of operation	44	45	10	1
Hardware reliability	30	45	20	5
Maintenance service	20	40	30	10
Software & technical support	11	39	35	15

All Displays

Overall performance	37%	53%	9%	1%
Ease of operation	41	49	9	1
Hardware reliability	31	46	19	4
Maintenance service	25	43	25	7
Software & technical support	13	40	35	12

As you can see from these figures, users consistently rated the IBM displays ahead of the others. The differences are so small as to be virtually negligible for overall performance, ease of operation, and even hardware reliability. But, comparatively speaking, the independents fell down on maintenance service, even though 60 percent of the responding users rated this category as good or excellent.

Neither IBM nor the independents scored well on software and technical support. For IBM, 42 percent rated this category fair or poor, while the independents collectively failed to please fully half (50 per cent fair or poor) of their responding users. These low ratings for software and technical support can be related directly to the complexity (read "flexibility" if you wish to state it in a positive vein) of working with a highly formattable device. In other words, there are a lot of things you can do with a CRT display device, and few of the manufacturers are providing the kind of support that makes users really comfortable.

The users were also asked questions designed to determine usage patterns for CRT display units. The results can be summarized as follows:

Manner of use	Number of user responses	Percent of total
Remotely, via communications lines	212	54
Locally, directly connected to a computer	242	61

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TABLE I. USERS' RATINGS OF CRT DISPLAY TERMINALS

CRT Display Supplier and Model	Number of User Responses	Number of Displays Represented	Overall Performance					Ease of Operation					Hardware Reliability					Maintenance Service					Software and Tech. Support				
			Wt. Av.	E	G	F	P	Wt. Av.	E	G	F	P	Wt. Av.	E	G	F	P	Wt. Av.	E	G	F	P	Wt. Av.	E	G	F	P
ADDS 880	5	20	3.6	3	2	0	0	4.0	5	0	0	0	3.5	2	2	0	0	3.3	1	3	0	0	2.8	1	1	2	0
Beehive	3	14	3.3	1	2	0	0	3.7	2	1	0	0	2.7	1	0	2	0	2.0	1	0	0	2.0	1	0	0	2	
Bunker Ramo 2200	11	165	3.3	6	3	1	1	3.2	5	3	1	1	3.1	5	2	2	1	2.4	2	1	5	1	2.0	0	2	6	
Burroughs TD 700	4	37	3.8	3	1	0	0	3.5	2	2	0	0	3.8	3	1	0	0	2.5	0	2	2	0	1.7	0	1	0	
Burroughs TD 800	6	68	2.5	1	1	4	0	3.0	1	4	1	0	2.2	0	2	3	1	2.5	0	3	3	0	2.2	0	2	3	
Burroughs 9352/9353	10	166	3.6	6	4	0	0	3.2	4	4	2	0	3.4	5	4	1	0	3.1	3	5	2	0	3.1	3	5	2	
Control Data 211	2	14	2.5	0	1	1	0	3.0	0	2	0	0	2.0	0	1	0	1	2.5	0	1	1	0	3.0	0	2	0	
Control Data 700	9	41	3.1	3	5	0	1	3.1	4	2	3	0	3.2	4	4	0	1	2.9	2	5	1	1	2.3	0	3	1	
Courier Executerm	5	185	3.2	2	2	1	0	3.6	3	2	0	0	2.8	2	0	3	0	3.3	2	0	1	2	3.0	2	1	2	
Data 100 Model 73	2	9	3.5	1	1	0	0	3.5	1	1	0	0	3.5	1	1	0	0	3.5	1	1	0	0	3.0	0	2	0	
Datapoint 2200	3	175	2.7	0	2	1	0	3.0	1	1	1	0	3.0	1	1	0	0	2.7	0	1	2	0	2.5	0	1	0	
Datapoint 3000/3300	11	37	3.0	4	4	2	1	3.1	4	5	1	1	2.5	0	7	2	2	2.1	1	2	5	3	2.1	0	3	2	
DEC VT05	4	24	3.0	1	1	1	0	3.7	2	1	0	0	3.3	1	2	0	0	3.0	0	3	0	0	3.0	1	1	1	
Digi-Log	2	4	3.5	1	1	0	0	3.0	0	2	0	0	3.5	1	1	0	0	3.5	1	1	0	0	3.0	1	0	1	
Four-Phase IV/70	14	243	3.2	4	9	1	0	3.2	5	7	2	0	3.1	5	6	2	1	2.4	2	3	8	1	2.4	2	4	5	
Four-Phase IV/40	2	5	3.5	1	1	0	0	3.0	1	0	1	0	3.5	1	1	0	0	2.5	0	1	1	0	2.5	0	1	1	
GTE IS/7700/7100	32	1,156	3.4	14	17	1	0	3.5	17	15	0	0	3.1	10	16	6	0	2.8	5	15	10	0	2.1	1	6	12	
Hazeltine 1000	4	5	3.0	1	2	1	0	2.8	1	1	2	0	3.3	1	3	0	0	3.3	1	2	0	0	3.3	1	2	0	
Hazeltine 2000	30	127	3.3	11	17	1	1	3.4	15	10	4	0	3.3	12	13	4	0	2.8	6	16	3	4	2.4	2	11	9	
Hendrix 5200/5700	2	4	3.0	0	2	0	0	3.5	1	1	0	0	3.0	1	0	1	0	2.5	0	1	1	0	2.0	0	0	2	
Honeywell VIP	4	107	3.0	1	2	1	0	3.3	1	3	0	0	2.3	0	2	1	1	2.5	0	2	2	0	2.3	0	1	3	
IBM 2260	30	470	3.1	4	24	2	0	3.0	6	17	7	0	3.1	7	17	5	0	3.5	11	14	5	0	2.7	4	13	10	
IBM 2265	3	6	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0	3.5	1	1	0	
IBM 3270	108	2,334	3.4	44	54	7	0	3.4	44	60	2	1	3.1	34	51	20	1	3.2	34	54	17	0	2.6	17	44	36	
Incoterm SPD 10/20	2	35	3.0	0	2	0	0	4.0	2	0	0	0	3.0	0	2	0	0	3.0	0	2	0	0	1.0	0	0	2	
ITT Alphascop	2	124	3.0	1	0	1	0	3.5	1	1	0	0	2.5	0	1	1	0	2.0	0	0	2	0	1.5	0	0	1	
ITT Asciscop	6	19	2.8	1	3	2	0	3.2	1	5	0	0	2.2	1	1	2	2	2.0	0	1	3	1	2.0	0	1	2	
Lear Siegler 7700	2	15	4.0	2	0	0	0	2.5	0	1	1	0	2.5	0	1	1	0	2.0	0	1	0	1	2.0	0	0	2	
Sanders 720	8	235	2.9	1	5	2	0	2.5	2	6	0	0	2.6	0	5	3	0	1.9	1	1	2	4	2.0	0	2	3	
Sanders 800	5	54	3.0	1	3	1	0	3.6	3	2	0	0	2.6	1	2	1	1	2.2	1	0	3	1	1.8	0	1	2	
Singer	2	15	3.0	0	2	0	0	2.0	0	0	2	0	3.0	0	2	0	0	2.5	0	1	1	0	1.5	0	0	1	
Sycor 340	5	453	3.8	4	1	0	0	3.4	2	3	0	0	2.4	0	2	3	0	2.8	1	2	2	0	3.0	1	3	1	
TEC 425/455	3	35	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0	2.5	0	1	1	0	2.5	0	1	1	
Tektronix 4000	15	252	3.3	4	11	0	0	3.2	4	10	1	0	3.1	4	9	2	0	3.1	5	6	3	0	2.7	0	10	4	
Terminal Comm's.	6	551	3.5	3	3	0	0	3.8	5	1	0	0	3.5	3	3	0	0	3.0	1	4	1	0	3.6	4	0	1	
Trivex 40/80	3	106	3.3	1	2	0	0	3.7	2	1	0	0	3.3	1	2	0	0	2.7	0	2	1	0	3.0	0	2	0	
Univac Uniscop 100	5	296	3.0	1	3	1	0	3.6	3	2	0	0	2.8	1	1	2	0	2.8	2	0	1	1	3.2	2	2	1	
Univac/RCA 750/752	4	73	3.5	2	2	0	0	3.3	1	3	0	0	3.3	2	1	1	0	3.3	2	1	1	0	3.3	1	3	0	
Unicom	3	32	4.0	3	0	0	0	3.0	1	1	1	0	3.0	0	3	0	0	3.7	2	1	0	0	3.3	1	2	0	
Westinghouse 1600	2	11	3.5	1	1	0	0	3.0	0	2	0	0	3.5	1	1	0	0	4.0	2	0	0	0	3.0	0	2	0	
All others*	15	136	3.2	4	10	1	0	3.3	6	7	2	0	2.6	3	4	5	2	2.6	3	5	3	3	2.6	1	8	4	
Total IBM	141	2,810	3.3	50	79	9	0	3.3	52	78	9	1	3.1	43	69	25	1	3.2	47	69	22	0	2.7	22	58	46	
Total Independents	253	5,048	3.3	95	129	24	4	3.3	110	113	25	2	3.0	75	110	49	13	2.7	47	96	71	25	2.5	25	86	78	
Grand Total	394	7,858	3.3	145	208	33	4	3.3	162	191	34	3	3.0	118	179	74	14	2.9	94	165	93	25	2.5	47	144	124	

LEGEND: Wt. Av.—Weighted Average, E—Excellent, G—Good, F—Fair, P—Poor.

The weighted average for each category is based on assigned weights of 4,3,2, and 1 for Excellent, Good, Fair, and Poor, respectively, for each response.

* Includes 1 response on each of 15 different models.

Manner of use	Number of user responses	Percent of total	Manner of use	Number of user responses	Percent of total
Single station, stand-alone	155	39	Fill-in-the-blanks formatted data entry	196	50
Clustered	140	36	Free-form (text) data entry	144	37
Programmable	38	10	Extensive editing	172	44
Structured data entry, a la keypunch	58	15	Little or no editing	119	30

All About CRT Display Terminals

➤ BUYING GUIDANCE

In selecting a CRT display terminal, as in acquiring most other types of computer equipment, your chances of picking the unit that's best for your installation will be far greater if you're willing to take the time to go about it in a systematic, logical way. The following selection procedure should help you get the maximum gain in computer throughput per dollar spent.

1. *Define the essential parameters* for a CRT terminal that will satisfy your needs; then, using Tables II through VI, select the features that meet the requirements of your application.
2. *Find out who supplies the terminals* with the parameters and features you have selected. Use the accompanying comparison charts to determine which manufacturers produce terminals that appear to satisfy your needs. Then check the User Experience section of this report to see how users rate each manufacturer's products. You'll probably be able to narrow down the list of potential suppliers to a few firms that have demonstrated their ability to supply and service, at competitive prices, the specific model of CRT terminal you need.
3. *Check the maintenance provisions.* Since maintenance is one of the key differentiating factors among the independent suppliers, you'll want to pay especially careful attention to this important area. Find out what organization supplies the maintenance service and learn all you can about it. Check the total size of the organization, the location and staffing of the closest service point, the promised response time for emergency service, the hours during which service is available, the nature and frequency of preventive maintenance, the size and location of the spare parts inventory, the procedure for handling engineering change orders, and the scope of the supplier's training program for his service technicians.
4. *Talk to users.* The CRT terminals that appear most promising at this point should now be further investigated by conferring with present users. Ask each supplier for a list of his customers—and don't take no for an answer. Then, find out all you can from each user. Ask why he chose that unit, when it was installed, what problems were encountered in installing it, how many failures have occurred, how quickly they were corrected, and whether any incompatibilities have been detected. Finally, ask how he thinks the terminal or the associated support could be improved. The answers to these questions are likely to be highly enlightening.
5. *Choose the vendor and model.* By now, you should have all the information you'll need to choose the terminal that will satisfy your requirements at the

lowest overall cost. If so, it's just about time to place your order.

6. *Negotiate a sound contract.* Now that you know which terminal you want, don't just sign the supplier's standard contract or order form. If you do, you're likely to end up with a lot less security and support than the user who's willing to take the time and trouble to indulge in some old-fashioned haggling. What's more, you may even be able to shave some more dollars off the price tag.

CRT TERMINAL CHARACTERISTICS

The accompanying comparison charts summarize the characteristics of 162 commercially available CRT display terminals from 65 vendors. Nearly all of the information was supplied by the manufacturers during the months of February and March 1974. Their cooperation is acknowledged and greatly appreciated.

Datapro sent repeated requests for information to more than 80 companies known or believed to be in the CRT terminal business. The 65 usable responses summarized in our charts provide a comprehensive picture of the commercial CRT display terminals that are currently available in the United States and Canada. *The absence of any specific company from our charts means that the company either failed to respond to our repeated information requests or was unknown to us.*

The chart entries and their significance are explained in the following paragraphs.

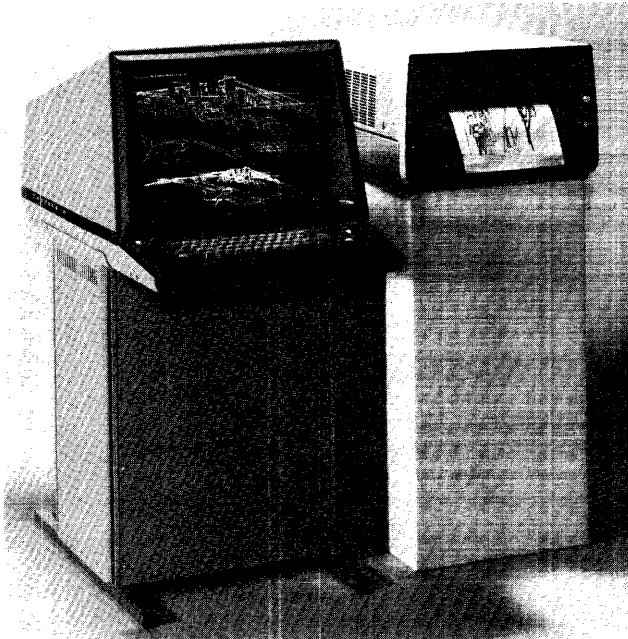
ARRANGEMENT

CRT display terminals are available in one of two basic terminal configurations, *stand-alone or cluster*. Stand-alone units are typically those that contain all components that support the operation of the terminal, including CRT screen, keyboard, and interface, within a single cabinet. (Auxiliary devices such as printers, cassette tape recorders, etc., are usually external devices. Sometimes a stand-alone unit includes separate cabinets for terminal control and keyboard/display portions, and it may even include one or two separate CRT displays.) A cluster configuration typically includes a terminal control unit and a number of individual, cable-connected keyboard/display units, sometimes located several thousand feet from the controller.

The term *programmable* can be defined several different ways. Datapro defines the term as operating under the direction of a program stored within the terminal, such as a user's application program or an emulation program that simulates the operation of a different terminal, usually one produced by another manufacturer.

Local operation refers to terminals that are capable of direct attachment to a computer via the computer's I/O

All About CRT Display Terminals



Representative of today's interactive graphic terminals, the Tektronix 4015 is built around a storage-tube display. It is available in several display arrangements and features vector, point, and incremental point graphic modes as well as an APL character set. The terminal ranges in price from \$8,450 to \$9,950. The 4610 Hard Copy Unit at right is an extra-cost option.

▷ channel and that can operate as on-line peripheral subsystems.

Some terminals are designed as direct replacements for other terminals. In the CRT terminal market, replacement terminals fall into three categories: those designed to replace an IBM 2260 and/or 2265, those designed to replace an IBM 3270, and those designed to replace a Teletype teletypewriter, Models 33 and 35. Datapro included these three entries to define the category of *compatibility*.

DISPLAY ORGANIZATION

Printed information is generally arranged according to an orderly format consisting of a maximum number of printed lines per page and characters per line. The orderly arrangement of printed matter also characterizes the arrangement of data displayed on the face of a CRT screen. The electronic circuitry that produces the display image is designed to a specified set of parameters which define the screen capacity (i.e., the maximum number of *display positions*), and the *display format* (i.e., the maximum number of displayable lines and displayable characters per line). Information is displayed in a rectangular area smaller than the total surface area of the CRT screen. The factors that determine the required size of the *display area* are the display arrangement and the size of the displayable characters, which is normally a fixed parameter.

Symbol formation and the set of *displayable symbols* are the function of the character generator, which accepts coded characters (typically ASCII) from the computer and keyboard and converts them to a number of dots or strokes so that the form of the symbol or image can be displayed on the face of the screen. Characters are formed by a variety of techniques, including dots, strokes, starburst, or monoscope. The dot technique is by far the most popular. Each character is formed within a matrix of dots, and only those dots required to form the specific character are intensified. Typically, a dot matrix contains 35 dots arranged 7 dots high by 5 dots wide. Characters can be made clearer by increasing the number of dots within the matrix. The stroke technique forms characters by drawing short straight lines between specified points.

REFRESH MEMORY

The refresh memory is usually large enough to store one "page", or screen-full of data. The cathode ray tube is refreshed about 60 times each second from memory so that the displayed image does not flicker. The memory may be loaded from the computer or from the keyboard; and in block-oriented displays, its contents can be transmitted from the terminal to the central computer. In character-oriented displays, such as those designed for Teletype compatibility, each character is sent to the computer as it is keyed; the character is returned or "echoed back" to the terminal's refresh memory either from the interface of the display or from the computer.

The *type* and capacity of the refresh memory differ among the various manufacturers. Memories can utilize magnetic core, delay line, or semiconductor technology. Most of the current CRT terminals feature semiconductor (MOS) memories primarily because they are less expensive, are readily available in sizes of 1024 bytes or more, require less space, and consume less power than core or delay-line memories, both of which were extensively used prior to the availability of semiconductor memories.

KEYBOARD

The style or *type* of keyboard defines the key-symbol arrangement, the character set that the keyboard can produce, and sometimes the code that is generated for each key depression, such as ASCII, EBCDIC, BCD, etc. Several different keyboard styles are available, including typewriter, keypunch (data entry), and Teletype typewriter. Some terminals are available with more than one keyboard style to permit the user to satisfy his particular need.

Some terminals are available with *function keys*. These are special keys whose character codes are interpreted by the user's program. A function key is used to reduce the number of required input keystrokes and therefore save time and reduce the number of input errors. The key cap ▷

All About CRT Display Terminals

- ▷ explains the function performed by the system when the system receives the unique code that is generated by the depression of each function key. Depressing one key could instruct the system to "sell one seat" or "call Chart A", for example.

A *numeric keygroup* is a special keyboard feature that includes a set or block of 10 numeric keys, usually located to the right of the main keygroup. These numeric keys are arranged in an adding-machine format and are particularly useful for applications that require volume numeric entry or arithmetic calculations.

Keyboards that can either fit flush against the CRT display or be located some distance away via cable connection are referred to as *detachable* keyboards. This feature provides increased configuration flexibility and operator convenience.

FEATURES

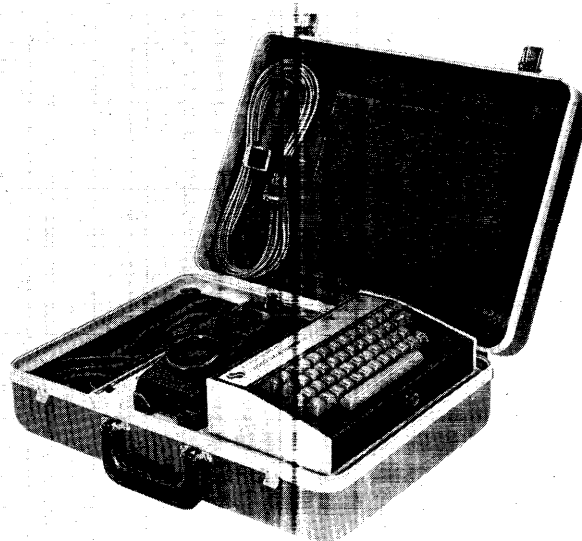
Today's CRT terminals offer a wide variety of potentially useful features and capabilities. No one terminal has them all, however, and some stripped-down economy models offer very few of them.

Many of these equipment features are essentially self-explanatory, and the unique features of specific terminals are thoroughly explained and evaluated in the individual DATAPRO 70 Peripheral reports on those terminals. For these reasons, only the CRT terminal features which are of general interest and which do not readily explain themselves are described in the paragraphs that follow. Comprehensive lists of desirable terminal features for specific application requirements, however, are presented in Tables II through VI.

The *cursor* marks the position on the screen where the next character will be read or written from memory. Cursor control enables the operator to maneuver the cursor on the screen and facilitates the input and output of data. Some terminals also have *program-addressable cursors*, which enable the position of the cursor to be read or written by the computer under program control. Some cursors *blink*; others keep moving as long as the control key remains depressed; and all should be of the non-destructive type. Different manufacturers use a variety of symbols to indicate the cursor position on the screen.

Typical cursor controls include:

- Move left (L)—moves the cursor one space to the left (which can be from the initial character position of a line to the last character position of the previous line if the terminal features wraparound).
- Move right (R)—moves the cursor one space to the right (which can be from the last character position of



I. P. Sharp's portable Video Data Terminal converts any conventional TV set into a CRT display terminal by simply clipping onto the set's antenna terminals. The unit features an APL keyboard and a telephone coupler that permits communication with a computer via any standard telephone.

a line to the first character position of the next line if the terminal features wraparound).

- Move up (U)—moves the cursor to the same position on the previous line (which can be from the first line to the last line if the terminal features wraparound).
- Move down (D)—moves the cursor to the same position on the following line (which can be from the last line to the first line if the terminal features wraparound).
- Home top (H)—moves the cursor to the initial character position of the first line.
- Home bottom—moves the cursor to the initial character position of the last line.
- Tab—moves the cursor to the next tab stop.
- Return (Rt)—moves the cursor to the initial character position of the next line (identical to the carriage return function of a typewriter).
- Backspace—moves the cursor one space to the left.
- Line Feed—moves the cursor to the same position on the following line.

Editing features in a CRT terminal may consist of any combination of the functions listed below, although the best terminal for editing purposes would include all of them. Each function is performed with respect to the

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Requirements	Helpful Features
minimum input errors	function keys editing format control
minimum operator training	typewriter keyboard format control
maintainability	local technical service modularity replaceable components
low cost	LSI circuits high production
operator satisfaction	green or white phosphor quiet operation flicker-free display cool operation linear presentation brightness control satisfactory character size
good appearance	attractive styling pleasing color compact size white phosphor cabinet material character style
unobtrusiveness	compact size quiet operation cool operation
minimum space	compact size LSI circuits
glamour	color display cabinet styling

Table II.
CRT Terminal Features for
the Requirements Common
to Most Applications

Requirements	Helpful Features
large screens	raster TV scan
withstanding dirty environment	adequate filtering cassettes instead of tape reels
distant viewing	large characters
clustered terminals	multistation controller
single terminal	stand-alone device
intramural connections*	long-line driver/receiver interface
communication line economy	party-line interface high speed full-duplex capability multiplexing built-in data set

Table III.
CRT Terminal Features for
Physical Application
Requirements

*An intramural connection is one that must run a distance greater than the normal EIA interface can drive without data sets (50 feet according to specifications). If the connection can be made without using local private phone lines and data sets, but with special long-line driving interfaces, the application will be able to run at much higher speeds, and the costs of the two data sets can be saved.

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Requirements	Helpful Features
text handling	upper/lower case character set large character matrix editing cursor control slewing cursor
data input	format control cursor control column counter editing
pointing	light pen large character matrix cursor
minimum typing	function keys cursor control block transmission editing
input verification	field selection cursor control blinking editing blinking tab stops
operator alert	blinking color display buzzer
protecting data fields	format control field protection
re-entering data	slewing cursor cursor control editing
drawing bar charts	graphic capability special character generator

Table IV.
CRT Terminal Features for
Man/Machine Application
Requirements

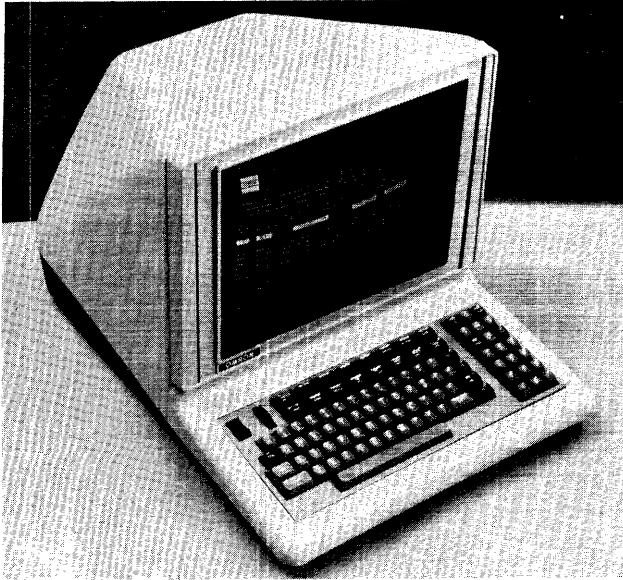
Requirements	Helpful Features
remote operations	data set interface long-line driver/receiver interface
fast access	high speed function keys
hard copy	printer cassettes (for later transcription)
local storage	page memory cassettes
simultaneous I/O	full duplex peripheral devices
logging	printer cassette

Table V.
CRT Terminal Features for
System Application
Requirements

Requirements	Helpful Features
special symbols television compatibility "teletype" compatibility	character generator options raster scan 72-character line 10-character/second speed ASCII coding and discipline
punched card compatibility code conformity special inputs	80-character line ASCII coding function keys special keyboard capability

Table VI.
CRT Terminal Features for
Compatible Application
Requirements

All About CRT Display Terminals



Omron's 3025 CRT Terminal is typical of the emerging programmable terminals on the market. Built around a microprocessor and programmable read-only memory (PROM), the terminal can store microcodes to emulate terminals produced by other manufacturers or perform specialized operations. The microcode can be quickly changed by interchanging PROMs.

➤ current position of the cursor. The desirable editing functions are:

- *Character insert*—the capability to insert a character into an existing line of displayed text; the text spreads to accommodate the added character. The “spreading” capability may terminate at the last character position of the line or at the last displayable position on the screen. Data is lost when it is spread beyond the termination point.
- *Character delete*—the capability to delete a character from an existing line of displayed text; the remaining text closes up when the character is deleted.
- *Line insert*—the capability to insert a line of text into existing text; the text spreads to accommodate the added line.
- *Line delete*—the capability to delete a line of text from existing text; the remaining text closes up when the line is deleted.
- *Line erase*—the capability to erase a complete line of displayed text beginning at the cursor location. Most terminals include *character erase* and some form of *display erase*, which may erase the entire contents of the display, just that portion following the cursor location, or a combination of both functions.

Some display terminals are equipped with a *roll* feature. This feature is analogous to the movement of printed

copy exiting from a teletypewriter as it is printed, and is an important feature for applications that require the operator to scan several blocks of text to locate key information. As each line of text is received from the computer or cassette tape, all existing lines of text move up or down by one line, depending on the direction of roll. (Some displays can roll in either direction, while others provide only one direction.) Data is lost as it rolls off the screen unless the display memory exceeds the screen capacity.

Most businesses use printed forms for daily activities such as billing, ordering, payroll, and a host of other applications. Some CRT terminals can duplicate the printed form on the face of the screen, and data can be keyed into the blank spaces just as the typist enters data into a printed form. This “fill-in-the-blanks” approach to data entry requires a *split screen* capability. Display terminals that incorporate this feature treat the fixed format differently from the keyed data. Field identifiers such as “name” or “salesman number” are protected from inadvertent key entry, and allowable entries are confined to the variable fields (blank spaces) following the field identifiers. Some terminals automatically tab to the beginning of the next variable field immediately following the entry of the character that completes each field. The tab key is used where a field is partially filled.

Having completed entry into the fixed format, the operator transmits the data to the central computer. A feature called *partial screen transmit* promotes line economies by transmitting only the keyed data; the fixed format remains displayed and the “blanks” are erased for the next entry.

Some special features that enhance the operation of a CRT terminal include:

- *Character repeat*—enters a continuous sequence of the symbol generated by a depressed key as long as the key remains depressed.
- *Character or field blinking* draws the operator’s attention to vital information by blinking only that character or field that presents the important data.
- *Programmable brightness levels*—visually separate different kinds of displayed information by displaying each type at a different intensity level. This feature is analogous to the use of color displays.
- *Audible alarm*—alerts the attention of an operator absent from the terminal to a pending message.

AUXILIARY DEVICES

External I/O devices can add considerable flexibility to the applications possibilities for CRT terminals. A *cassette recorder* can be used to store display formats, data to be ➤

All About CRT Display Terminals

➤ transmitted, or user programs in the case of intelligent terminals. A *printer* provides hard copy when required. A *light pen* permits the user to initiate commands or to "call for" a page of data by pointing the pen at a displayed entry. Although the above I/O devices are the most common, other devices can be and are used, such as industry-compatible 7- or 9-track magnetic tape drives, disk drives (cartridge or pack type), card readers, etc.

TRANSMISSION

The CRT terminal contains a communications interface that enables communications between the terminal and the central computer site. *Mode* and *technique* define the operating mode and the method in which data is transmitted. There are three operating modes: Simplex (transmission in one direction only), half duplex (transmission in both directions, but not simultaneously), and full duplex (simultaneous transmission in both directions).

Data is transmitted synchronously or asynchronously. Asynchronous transmission is characterized by the transmission of data in irregular spurts, where the duration of time can vary between successive transmitted characters; the transmission from an unbuffered teletypewriter is a good example. Synchronous transmission implies the transmission of data in a steady stream. Each transmitted character is clocked and, the time interval between successive characters is always precisely the same. The communications interface either provides clocking or accepts external clocking signals from the data set.

The transmission *code* refers to the bit pattern of the transmitted characters. Two codes are prominent, EBCDIC and ASCII; the latter has been accepted as an industry and government standard, and is now by far the most commonly used code.

The CRT terminal is a high-speed device that is typically capable of transmitting and receiving several thousand characters per second; however, it must run at a *speed* that is compatible with the communications system in which it is used. Most terminals are used on voice-grade facilities, which limit the transmission speed to a practical maximum of 4800 bits per second over the dial network and 9600 bits per second over leased or private lines.

Block or character transmission refers to the way data is transmitted. Terminals that are designed to be transmission-compatible with a Teletype unit transmit a character for each key depression. Buffered terminals transmit data in multi-character blocks. The block mode permits data to be composed and edited prior to each transmission and generally permits more efficient utilization of the communications facility. Some terminals offer manual selection between the two modes.

The terminal's interface generally meets the standard *EIA RS-232B/C* specification and connects to a modem or acoustic telephone coupler.

Some terminals contain an *integral modem* that can be connected directly to a communications line via a Bell System Data Access Arrangement. In some cases the manufacturer also provides an acoustic and/or inductive *telephone coupler* so that the terminal can be connected to a conventional telephone handset.

PRICING AND AVAILABILITY

The comparison charts show the monthly rental prices under 1-year and 2-year leases and the purchase prices for each display unit and for its controller where applicable. Many CRT terminal suppliers do not lease their equipment, and in these cases you'll find dashes in the lease price entries. Many of these suppliers, such as Conrac Corporation, sell OEM only. Single entries generally indicate the price of a basic unit without options; price ranges show the price of the basic unit and the price of an expanded unit with all options.

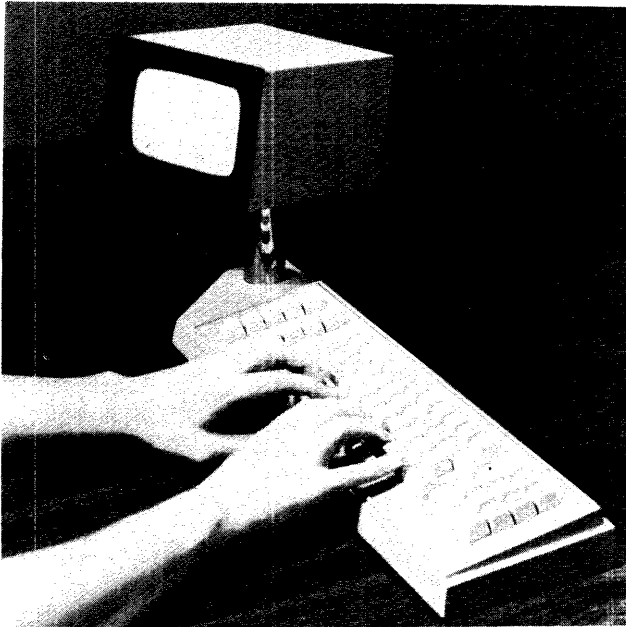
Date of first delivery indicates when the first production model of each CRT terminal was delivered (or is scheduled to be delivered) to a customer.

Number installed to date shows how many CRT terminals of each type had been delivered to customers as of April 1, 1974. All figures were supplied by the manufacturers themselves, and a number of companies chose not to release this information. ➤



Digi-Log's low-priced 3300 Microterm is adaptable to specific user applications via its microprocessor and programmable read-only memory for microprogram storage. The stand-alone unit with 16K bytes of memory is available in several screen sizes up to 1920 characters and sells for \$1,700 to \$2,100.

All About CRT Display Terminals



This novel display unit by Car-Mel is available as a stand-alone or cluster arrangement, displays up to 512 characters on a 3.5-by-4.5-inch screen, features a 10-key numeric keypad, and sells for \$2,000.

➤ Comments at the bottom of the charts describe significant or unusual features, capabilities, or applications which are not reflected in the standard entries.

CRT TERMINAL MANUFACTURERS

Listed below, for your convenience in obtaining additional information, are the full names and addresses of the 65 suppliers whose products are summarized in the comparison charts.

Ann Arbor Terminals, Inc., 6107 Jackson Road, Ann Arbor, Michigan 48103. Telephone (313) 769-0926.

Applied Digital Data Systems Inc. (ADDS), 100 Marcus Boulevard, Hauppauge, New York 11787. Telephone (516) 231-5400.

Beehive Terminals (Subsidiary of Beehive Medical Electronics, Inc.), 876 West 2600 South, P.O. Box 19244, Salt Lake City, Utah 84119. Telephone (801) 487-0741.

Bendix Interactive Terminals Corporation (Subsidiary of the Bendix Corporation), Bendix Center, Southfield, Michigan 48076. Telephone (313) 352-6035.

Bunker Ramo Corporation, Business and Industry Division, Trumbull Industrial Park, Trumbull, Connecticut 06609. Telephone (203) 377-4141.

Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Car-Mel Electronics, Inc., 2218 Cotner Avenue, Los Angeles, California 90064. Telephone (213) 934-1866.

Comptek, Inc., 143 Albany Street, Cambridge, Massachusetts 02139. Telephone (617) 864-5140.

Computer Communications Incorporated, 5933 W. Slauson Avenue, Culver City, California 90230. Telephone (213) 391-0328.

Computer Optics, Inc., Berkshire Industrial Park, Bethel, Connecticut 06801. Telephone (203) 744-6720.

Conrac Corporation, 600 N. Rimsdale Avenue, Covina, California 91722. Telephone (213) 966-3511.

Control Data Corporation, 8100 34th Avenue S., Minneapolis, Minnesota 55440. Telephone (612) 853-4656.

Courier Terminal Systems, Inc. (Subsidiary of Boothe Computer Corporation), 2202 E. University Drive, Phoenix, Arizona 85034. Telephone (602) 244-1392.

Datamedia Corporation, 7300 N. Crescent Boulevard, Pennsauken, New Jersey 08110. Telephone (609) 665-2382.

Data 100 Corporation, 7725 Washington Avenue South, Minneapolis, Minnesota 55435. Telephone (612) 941-6500.

Datapoint Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284. Telephone (512) 696-4520.

Delta Data Systems Corporation, Woodhaven Industrial Park, Cornwells Heights, Pennsylvania 19020. Telephone (215) 639-9400.

Digi-Log Systems, Inc. Babylon Road, Horsham, Pennsylvania 19044. Telephone (215) 672-0800.

Digital Equipment Corporation (DEC), 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

Four-Phase Systems, Inc., 10420 N. Tantau Avenue, Cupertino, California 95014. Telephone (408) 255-0900.

GTE Information Systems, One Stamford Forum, Stamford, Connecticut 06904. Telephone (203) 357-2000.

Hazeltine Corporation, Greenlawn, New York 11740. Telephone (516) 261-7000.

Hendrix Electronics, 645 Harvey Road, Manchester, New Hampshire 03103. Telephone (603) 669-9050.

Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California 94304. Telephone (415) 493-1501.

Honeywell Information Systems Inc. 60 Walnut Street, Wellesley Hills, Massachusetts 02181. Telephone (617) 237-4100.

Hughes Aircraft Company, Industrial Products Division, 2020 Oceanside Boulevard, Oceanside, California 92054. Telephone (714) 757-1200.

International Business Machines Corporation (IBM), Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

Imlac Corporation, 150 A Street, New England Industrial Center, Needham, Massachusetts 02194. Telephone (617) 449-4600.

Incoterm Corporation, 6 Strathmore Road, Natick, Massachusetts 01760. Telephone (617) 655-6100.

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- *Information Displays, Incorporated*, 333 N. Bedford Road, Mount Kisco, New York 10549. Telephone (914) 241-1000.
- Infoton, Inc.* (Subsidiary of Optical Scanning Corporation), Second Avenue, Burlington, Massachusetts 01803. Telephone (617) 272-6660.
- International Computers Ltd. (ICL)*, 555 Madison Avenue, New York, New York 10022. Telephone (212) 758-5220.
- International Telephone and Telegraph Corporation (ITT)*, Data Equipment and Systems Division, 157 E. Union Avenue, East Rutherford, New Jersey 07073. Telephone (201) 935-3900.
- Jacquard Systems*, 1505 11th Street, Santa Monica, California 90404. Telephone (213) 393-3711.
- Kustom Electronics Incorporated*, Data Communications Division, 1010 West Chestnut, Chanute, Kansas 66720. Telephone (316) 431-4380.
- Lear Siegler, Inc., Electronic Instrument Division*, 714 N. Brookhurst Street, Anaheim, California 92803. Telephone (714) 774-1010.
- Megadata Computer and Communications Corporation*, 10 Evergreen Place, Deer Park, New York 11729. Telephone (516) 667-2900.
- National Cash Register Company (NCR)*, Main and K Streets, Dayton, Ohio 45409. Telephone (513) 449-6606.
- Olivetti Corporation of America*, 500 Park Avenue, New York, New York 10022. Telephone (212) 371-5500.
- Omron Systems, Incorporated*, 432 Toyama Drive, Sunnyvale, California 94086. Telephone (408) 734-8400.
- Ontel Corporation* (formerly Sugarman Laboratories, Inc.), 3 Fairchild Court, Plainview, New York 11803. Telephone (516) 822-7800.
- Pertec Business Systems*, 17112 Armstrong Avenue, Santa Ana, California 92705. Telephone (714) 540-8340.
- Plantronics, Incorporated*, 385 Reed Street, Santa Clara, California 95050. Telephone (408) 249-1160.
- Princeton Electronics Products, Inc.*, P.O. Box 101 New Brunswick, New Jersey 08902. Telephone (201) 297-4448.
- Quotron Systems, Incorporated* (formerly Scantlin Electronics), 5454 Beethoven Street, Los Angeles, California 90066. Telephone (213) 398-2761.
- Raytheon Data Systems Company*, Division of Raytheon Company, 1415 Boston-Providence Turnpike, Norwood, Massachusetts 02062. Telephone (617) 762-6700.
- RCA Custom Terminal Systems*, 8500 Balboa Boulevard, Van Nuys, California 91409. Telephone (213) 894-8111.
- Research, Inc.*, P.O. Box 24064, Minneapolis, Minnesota 55424. Telephone (612) 941-3300.
- Sanders Data Systems, Incorporated* (subsidiary of Sanders Associates Incorporated), Daniel Webster Highway South, Nashua, New Hampshire 03060. Telephone (603) 885-6685.
- Scientific Measurement Systems, Incorporated*, 26 Olney Avenue, Cherry Hill, New Jersey 08003. Telephone (609) 424-5220.
- I.P. Sharp Associates, Limited*, P.O. Box 1900, 339 William Street, Carleton Place, Ontario, Canada. Telephone (613) 257-3610.
- Sycor Inc.*, 100 Phoenix Drive, Ann Arbor, Michigan 48104. Telephone (313) 971-0900.
- SYS Computer Corporation*, 1725 DiCarolus Court, Hackensack, New Jersey 07601. Telephone (201) 488-0300.
- Tec, Inc.*, 9800 N. Oracle Road, Tucson, Arizona 85704. Telephone (602) 297-1111.
- Tektronix, Inc.*, P.O. Box 500, Beaverton, Oregon 97005. Telephone (503) 644-0161.
- Teletype Corporation*, 5555 Touhy Avenue, Skokie, Illinois 60076. Telephone (312) 982-2000.
- Terminal Communications, Incorporated*, 3301 Terminal Drive, Raleigh, North Carolina 27611. Telephone (919) 834-5251.
- Texas Scientific Corporation*, 8000 Harwin Drive, Texas 77036. Telephone (713) 785-7731.
- Trivex, Inc.*, Information Systems Division, 3180 Red Hill Avenue, Costa Mesa, California 92626. Telephone (714) 546-7781.
- UNIVAC Division*, Sperry Rand Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19422. Telephone (215) 542-4011.
- Wang Laboratories, Inc.*, 836 North Street, Tewksbury, Massachusetts 01876. Telephone (617) 851-4111.
- Westinghouse Canada Ltd.*, P.O. Box 510, Hamilton, Ontario, Canada. Telephone (416) 528-8811.
- Wiltek, Inc.*, Glover Avenue, Norwalk, Connecticut 06850. Telephone (203) 853-7400.
- Wyle Computer Products, Inc.*, 128 Maryland Street, El Segundo, California 90245. Telephone (213) 322-1763.
- Xerox Data Systems*, 701 S. Aviation Boulevard, El Segundo, California 90245. Telephone (213) 679-4511. □

All About CRT Display Terminals

SUPPLIER AND MODEL	Ann Arbor Terminals DESIGN III KSR	Ann Arbor Terminals DESIGN III ASR	Ann Arbor Terminals Series 200 KSR	Ann Arbor Terminals Series 200 ASR	ADDS Consul 580
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone 1 No No Yes No No	Stand-alone 1 No No Yes No No	Stand-alone 1 No No Yes No No	Stand-alone 1 No No Yes No No	Stand-alone — No No Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	256 to 3200 8 x 32 to 40 x 80 14-inch diag. tube 64 or 96 5 x 7 or 7 x 9 dot matrix	1920; 3200 24 x 80; 40 x 80 14-inch diag. tube 64; 36 5 x 7; 7 x 9 dot matrix	256 to 3200 8 x 32 to 40 x 80 9- to 23-inch tube 64 or 96 5 x 7 or 7 x 9 dot matrix	1920; 3200 24 x 80; 40 x 80 9- to 23-inch screen 64; 96 5 x 7; 7 x 9 dot matrix	1920 24 x 80 8 x 10 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 256 to 3200	MOS 1920; 3200	MOS 256 to 3200	MOS 1000; 3200	MOS 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype 3 opt. Std. Std.	Teletype 3 opt. Std. Std.	Teletype 3 opt. Std. Std.	Teletype 3 opt. Std. Std.	ASCII None Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt No Std. Opt. No No No No Up only Opt. (std.) No (std.) Std. Char. opt. 2 opt. Spec. option Protected video, auto Lf on CR, New Line, Hold at EOL opt.	L,R,U,D,H,Rt Std. Std. No No No No Up only Std. Std. Std. Char. and field std. 2 std. Spec. option Protected format, full error detection, compressed trans- mission std.	L,R,U,D,H,Rt No Std. Opt. No No No Up, only Opt. No Std. Char. opt. 2 opt. Spec. option Reverse video, auto LF on CR, New Line, Hold at EOL Opt.	L,R,U,D,H,Rt Std. Std. No No No No Up only Std. Std. Std. Char. and field std. 2 std. Spec. option Protect format, full error detection, compressed trans- mission std.	L,R,U,D,H No Std. Opt. No No No Std. No No Std. No Nc Std. —
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None None None None	None None None None	None None None None	None None None None	Single/dual drive Non-impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char.; block opt. Opt. No	Full duplex Asyn./syn. ASCII 110 to 9600 Char.; block opt. Std. Special opt. No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char.; block opt. Opt. Opt. No	Full duplex Asyn./syn. ASCII 110 to 9600 Char.; block opt. Std. Special opt. No	Half/full duplex Asynchronous ASCII 110 to 9600 Character Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 1,640 to 2,665 — — — December 1973 — Ann Arbor	— — 2,200; 2,760 — — — December 1973 — Ann Arbor	— — 390 to 674 — — — 915 to 1,940 March 1972 — Ann Arbor	— — 390 to 674 — — — 1,475; 2,035 March 1972 — Ann Arbor	— — 1,795 — — — September 1973 1,500 (incl. NCR) NCR
COMMENTS	Terminals are available in a total of 7 display formats: 8x 32, 16 x 32, 24 x 40, 16 x 80, 24 x 80, 20 x 50, and 40 x 80; last two arrangements use 9 x 9 dot matrix for 96-char. set. RO version also available without keyboard. Uses same circuitry as Series 200, but housed in attractive case work. ASR is pollable.		Available in same arrangements as DESIGN III. Available as controller only; also available as circuit boards only; 9-, 11-, 14-, or 23-inch monitor available, desk or rack mount.	Available as controller only; also available as circuit boards only; pollable; 9-, 11-, 14-, or 23-inch monitor available, desk or rack mount.	20 ma. interface available; also available from NCR as Model 796-101.

All About CRT Display Terminals

SUPPLIER AND MODEL	ADDS Consul 880	ADDS Consul 880A	ADDS Envoy 680	ADDS MRD 780	Beehive Mini Bee 1
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Stand-alone — No No No No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920 24 x 80 8 x 10 64 5 x 7 dot matrix	1920 24 x 80 8 x 10 64 5 x 7 dot matrix	1920 24 x 80 4 x 5 64 5 x 7 dot matrix	1920 24 x 80 — 64 5 x 7 dot matrix	2000 25 x 80 6 x 9 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1920	MOS 1920	MOS 1920	MOS 1920	MOS 2000
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Std. No	ASCII None Std. No	ASCII None No No	ASCII None Std. Opt.	Teletype None No Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H Std. Std. No Std. No Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 Opt. Vector generation; 72 x 160 dots	L,R,U,D,H Std. Std. No Std. No Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 Std. No Vector generation; 72 x 160 dots	L,R,U,D,H Std. Std. No Std. No Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 Std. No Vector generation; 72 x 160 dots	L,R,U,D,H Std. Std. No Std. No Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 Std. No Vector generation; 72 x 160 dots	L,R,U,D,H,Rt No No Std. No No No Std. No No Std. No 2 Std. Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single/dual drive Non-impact Non None	Single/dual drive Non-impact None None	None None None None	Single/dual drive Thermal None None	See Comments Impact/non-impact None Card reader
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII Up to 9600 Char./line/block Std. Opt. Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Block Std. No No	Half duplex Asynchronous ASCII Up to 300 Char./line/block No No Std.	Half/full duplex Asynchronous ASCII Up to 9600 Char./line/block Std. No No	Half/full duplex Asyn/syn ASCII 110 to 9600 Character Std. No Std.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 2,990 to 3,710 — — — April 1970 3,500 (incl. NCR) NCR	— — 3,300 to 3,800 — — — September 1973 500 (incl. NCR) NCR	— — 99-106 (3-yr.) 3,895 to 4,090 — — April 1970 150 NCR	— — 2,550 to 3,695 — — — April 1970 750 NCR	57 — 1,710 — — — June 1973 — Beehive
COMMENTS	Also available from NCR as Model 796-201.	Up to 96 units can be chained onto one line; also available from NCR as Model 796-301.	Portable unit; weighs 26 lbs.	Rack-mounted TV controller; separate keyboard and TV monitors.	A single, dual, or triple-drive cassette recorder is avail- able; switch select- able transmit speeds.

All About CRT Display Terminals

SUPPLIER AND MODEL	Beehive Mini Bee 2	Beehive Mini Bee 4	Beehive Super Bee 2	Beehive Super Bee 3	Bendix Logiport/2
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes Opt. Opt.	Stand-alone — No Yes Yes Opt. Opt.	Stand-alone — Yes Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	2000 25 x 80 6.5 x 8 64 5 x 7 dot matrix	2000 25 x 80 6.5 x 8 96 5 x 7 dot matrix	2000 25 x 80 6 x 9 224 5 x 7 dot matrix	2000 25 x 80 9 x 12 224 7 x 9 dot matrix	1280 80 x 16 5 x 7 64; 96 opt. 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 2000	MOS 2000	MOS 2000	MOS 2000	MOS 1280
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype None Opt. Std.	ASCII None Std. Std.	ASCII None Std. Std.	ASCII None Std. Std.	ASCII 4 st.; 9 opt. Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt No No Std. No No Std. Std., up only No No Std. No No Std. Std. Std. Std. Std. Std. Std. None	L,R,U,D,H,Rt No Std. Std. No No No Std., up only Std. Std. Std. No No Std. Std. Std. Std. Std. None	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 3 std. Std. Std. Scroll up or down by line or page	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 3 std. Std. Std. Scroll up or down by line or page	L,R,U,D,H Std. Std. Std. No No Std. Std. Opt. Std. Std. No Opt. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None None None None	None None None None	See Comments Impact/non-impact None Card reader	See Comments Impact/non-impact None Card reader	None None None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 9600 Character only Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn/syn ASCII 9600 Char./block Std. No Std.	Half/full duplex Asyn/syn ASCII 9600 Char./block Std. No Std.	Half/full duplex Asynchronous ASCII 110 to 4800; 9600 Opt. Char.; block opt. Std. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	65 — 1,705 to 1,795 — — — August 1973 450 Beehive	80 — 1,995 to 2,195 — — — April 1974 — Beehive	— — 2,895 — — — May 1973 — Beehive	— — 3,295 — — — June 1974 — Beehive	— — 2,450 — — — — — Bendix
COMMENTS			A single, dual, or triple-drive cassette recorder is available.	A single, dual, or triple-drive cassette recorder is available.	Portable CRT.

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SUPPLIER AND MODEL	Bendix 3001	Bunker Ramo Model 2204/15	Bunker Ramo Model 2206/17	Bunker Ramo Model 2212	Bunker Ramo Model 2210
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes Yes Yes No No	Cluster 36 No Yes No Yes No	Cluster 36 No Yes No Yes No	Cluster 36 No Yes No Yes No	Cluster 36 No Yes No Yes No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1280 80 x 16 6 x 10 64; 96 opt. 5 x 7 dot matrix	1920 24 x 80 5.4 x 7.2 96 5 x 7 dot matrix	1920 24 x 80 6.25 x 8.75 96 5 x 7 dot matrix	480 12 x 40 3 x 4 96 5 x 7 dot matrix	200 10 x 20 2 x 2.25 96 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1280	MOS 1K to 9K	MOS 1K to 9K	MOS 1K to 9K	MOS 1K to 9K
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII 4 st., 9 opt. Std. Opt.	ASCII 16 std. Std. Std.	ASCII 16 std. Std. Std.	ASCII 12 std. Std. No	ASCII 6 std. Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. No No Std. Std. No Opt. Std. Std. No Opt. Std. No Opt. None	L,R,H,Rt. Std. Std. No Std. No Std. No Std. No Std. No Both std. No Opt. None	L,R,H,Rt Std. Std. No Std. No Std. No Std. No Std. No Both std. No Opt. None	L,R,H,Rt Std. Std. No Std. No Std. No Std. No Std. No Both std. No No None	L,R,H,Rt Std. Std. No No No Std. No Std. No Std. No Both std. No No None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None None None None	None Impact No Paper tape reader/punch	None Impact None Paper tape reader/punch	None Impact None Paper tape reader/punch	None Impact None Paper tape reader/punch
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 4800; 9600 opt. Char.; block opt. Std. No No	Half/full duplex Asyn./syn. ASCII 1200 to 4800 Block Std. Opt. Opt.	Half/full duplex Asyn./syn. ASCII 1200 to 4800 Block Std. Opt. Opt.	Half/full duplex Asyn./syn. ASCII 1200 to 4800 Block Std. Opt. Opt.	Half/full duplex Asyn./syn. ASCII 1200 to 4800 Block Std. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Served by	— — 2,300 — — — — — — Bendix	— 36 1,440 — 89 to 380 3,500 to 15,000 March 1973 — Bunker Ramo	— 35 1,390 — 89 to 380 3,500 to 15,000 January 1970 30,000 Bunker Ramo	— 35 1,345 — 89 to 380 3,500 to 15,000 January 1970 — Bunker Ramo	— 18 760 — 89 to 380 3,500 to 15,000 January 1970 — Bunker Ramo
COMMENTS		Display models 2204/15, 2206/17, 2212, and 2210 can be intermixed on the same controller. Also see Report 70D-110-01.			

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SUPPLIER AND MODEL	Burroughs TD 700	Burroughs TD 800	Car-Mel I 211 and R 211	Car-Mel D-301 and D-302	Car-Mel M-501
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No No Burroughs only Opt. No	Stand-alone — No Yes No Yes No	Stand-alone — No R 211 only Yes No No	See Comments 1 or up to 128 No No No No No	Stand-alone — No No Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	256 8 x 32 3.25 x 8.75 64 5 x 7 dot matrix	960/1920 12/24 x 80 7.5 x 9.5 64 5 x 7 dot matrix	512 16 x 32 3.5 x 4.5 64 5 x 7 dot matrix	512 16 x 32 3.5 x 4.5 64 5 x 7 dot matrix	512 16 x 32 3.5 x 4.5 128 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	Not specified 256 to 1,024	MOS 960/1920	MOS 512	MOS 512	MOS 512
KEYBOARD Type Program function keys Numeric keygroup Detachable	Several available No Std. Std.	ASCII None Std. Opt.	Teletype None None See Comments	ASCII 10 std. Std. No	— — — —
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt. Opt. Not specified Not specified Opt. No No No No Opt. Opt. No No No —	L, R, U, D, H, Rt. Std. No Std. Std. No No No Std. None	L, R, U, D, H, Rt. No Std. No No No No Std.; up only Std. No No No 2 std. Std. None	L, R, U, D, H, Rt. Std. Std. No No No No Std. (D-302), up only Std. Opt. (D-302 only) No No 2 std. Std. None	None No No No No No Std., up only Std. No No No No Control characters displayed at lower intensity
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact opt. None None	None Impact None None	None None None None	None None None None	None None None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asyn./syn. ASCII 150 to 9600 Char. or block Std. No No	Half duplex Asyn./syn. ASCII 76 to 9600 Character Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Character only Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Char. (301); block (302) Std. No No	Simplex Asynchronous ASCII 110 to 9600 Character only Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	34 to 132 — 3,378 to 5,226 — — — NA — Burroughs	— — 4,750 to 5,490 — — — July 1973 — Burroughs	— — 1,850 to 2,200 — — — Oct./Dec. 1972 550 Car-Mel	— — 1,950 (301); 2,050 (302) — — — Aug. 73/Mar. 74 55 Car-Mel	— — 1,600 — — — — — Car-Mel
COMMENTS	Terminal uses Burroughs Self-Scan gas technology display panel; display, control, and keyboard are separate; display is noted for clarity; several terminals can share one modem.		I 211 is designed for executive use, with keyboard in drawer; R 211 is rack mounted.	Quantity discounts available; D-301 is stand-alone unit; D-302 is stand-alone or cluster.	Quantity discounts available; M-501 is used as a monitor and does not have keyboard.

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SUPPLIER AND MODEL	Computek Model 200	Computek Model 300	Computer Communications Model CC-40	Computer Optics CO: 75	Computer Optics CO: 77
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes Yes Yes Yes Yes	Stand-alone — No No Yes No No	Either 15 No Yes No No No	Cluster 32 No No No Yes No	Either 32 No Yes No No Yes
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	2000 25 x 80 6 x 8 128 14 x 20 dot matrix	1008 24 x 42 6 x 7 64 5 x 7 dot matrix	960/3200 24 x 40/80 Variable 64; 96 opt. 5 x 7 dot matrix	1920/1500/3000 24 x 80; 15/30 x 100 15 (diagonal) 86 16 x 18 dot matrix	480; 960; 1920 12 x 40/80; 24 x 80 15 (diagonal) 64; 96 opt. 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 2000	MOS 1008	MOS 2048	MOS 1500/1920/3000	MOS 480; 960; 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII; Teletype; etc. 22 std. Std. Opt.	ASCII; Teletype None None Opt.	ASCII 16 std. None Std.	ASCII; 3 versions 3 opt. None Std.	Typewriter; ASCII/ EBCDIC 12 opt. Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Both std. 2 std. Opt. None	L, R, U, D, H, Rt. Std. Std. Opt. Std., delete only No No Opt. No No No No No No No No No No Full graphics	L, R, U, D, H, Rt. Std. Std. Std. No No Std. No Std. Std. Std. Std. Std. Std. Std. Opt. field only No Opt. Color; paging; polling/addressing	L, R, U, D, H, Rt. Std. Opt. No Std. Opt. Std. No No Std. Std. Std. Opt. field only No Opt. None	L, R, U, D Std. Std. No Std. Opt. Std. No Std. Std. Std. No 2 std. Opt. Opt. ID Card Reader
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single/dual drive Impact/non-impact Opt. None	None Hard copy unit None Graphics tablet	None Impact/non-impact Opt. None	None Impact None None	None Impact Opt. None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. Any code 110 to 19,200 Block or character Std. Opt. Opt.	Half/full duplex Asynchronous ASCII 110 to 1200 Character only Std. No Opt.	Half/full duplex Asyn./syn. ASCII 150 to 9600 Block Std. No No	Full duplex Asynchronous ASCII 1000 to 4800 Block Std. No No	Half/full duplex Synchronous (BSC) ASCII; EBCDIC 1200 to 9600 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	200 to 300 160 to 240 3,000 to 6,000 — — — 1972 Over 1,000 Computek	200 160 4,000 to 6,000 — — — 1972 Over 500 Computek	— — 2,950 to 5,600 — — — March 1974 — CCI	80 80 2,493 149 to 415 148 to 415 4,625 to 13,030 1st qtr. 1971 50 COI/Scan-Optics/ Honeywell	54 to 192 51 to 182 1,449 to 3,489 249 239 6,233 1st qtr. 1974 — COI, Syntronics
COMMENTS			Uses any standard b/w or color tele- vision set.		Also available with optional 16 x 18 dot matrix.

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SUPPLIER AND MODEL	Conrac Model 401	Conrac Model 480 TTY Plus	Control Data Model 711	Control Data Model 713	Control Data Model 714
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Either 16 No Yes Yes Yes No	Either 32 No Yes Yes No No	Stand-alone — No No No No No	Stand-alone — No No Yes No No	Cluster 15 No No No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	2000 25 x 80 7.5 x 10 128 5 x 7 dot matrix	480; 640 opt. 6/8 x 80 3 x 7 64 5 x 7 dot matrix	640; 1280 opt. 8/16 x 80 8 x 10 64; 96 opt. 5 x 9 dot matrix	640; 1280 opt. 8/16 x 80 8 x 10 64; 96 opt. 5 x 9 dot matrix	640/1280 8/16 x 80 8 x 10 64; 96 opt. 5 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 2000	MOS 480/640	MOS 640; 1280 opt.	MOS 640; 1280 opt.	MOS 640/1280
KEYBOARD Type Program function keys Numeric keygroup Detachable	Data entry 5 to 25 None Opt.	Teletype None None Opt.	ASCII None Yes No	Teletype None Yes No	ASCII None Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. None	L, R, U, D, H No Std. No Opt. Opt. No Opt. Std. Std. Std. No No Std. None	L, R, U, D, H Std. Opt. Std. Opt. Opt. No Std., up only Opt. Opt. Std. No No 2 Std. Std. None	L, R, U, D, H, Rt. No No Std. No Std. Std. No Std. Std. No No Std. None	L, R, U, D, H, Rt. Std. Std. Std. Opt. Opt. Std. Std. Opt. Opt. Std. No 2 Std. Std. Reverse video opt.
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Interface Teletype None Interface for floppy disk	None None None Interface for floppy disk	None Impact/non-impact None None	None Non impact None None	None Impact/non-impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half duplex Synchronous ASCII 2000 to 4800 Block Std. No No	Half/full duplex Asynchronous ASCII 75 to 300 Character Std. No No	Half/full duplex Asyn./syn. ASCII 2000 to 4800 Char./block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 2,600 to 3,300 — — 3,500 to 6,000 September 1970 Over 5,000 (all models) Supplier	— — 925 to 1,200 — — 3,000 to 5,000 June 1973 Over 5000 (all models) Supplier	90 to 111 — 3,500 to 4,120 — — June 1971 800 CDC	60 to 70 — 1,995 to 2,315 — — April 1971 1,400 CDC	75 to 89 — 3,300 to 3,900 135 to 158 — — 5,300 to 6,300 July 1973 — CDC
COMMENTS	Also available with Burroughs interface; OEM only.	OEM only			

All About CRT Display Terminals

SUPPLIER AND MODEL	Courier C270	Courier C270	Courier C275	Courier C275MS	Courier Executerm 60 & 260
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 3270 compatible IBM 3270 compatible	Cluster 32 No No No No No Yes	Cluster 64/160 No Yes No No Yes	Stand-alone — No No No No Yes	Cluster 5 No No No No Yes	Cluster 16 No No No Yes No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	480/960/1920 12 x 40/80; 24 x 80 8 x 11 64; 96 opt. 7 x 10 dot matrix	480/960/1920 12 x 40/80; 24 x 80 8 x 11 64; 96 opt. 7 x 10 dot matrix	480/960/1920 12 x 40/80; 24 x 80 8 x 11 64; 96 opt. 7 x 10 dot matrix	480/960/1920 12 x 40; 24 x 80 8 x 11 64; 96 opt. 7 x 10 dot matrix	480/960/1920 12 x 40; 12/24 x 80 4.8 x 64; 6 x 11 64 7 x 8 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 480/960/1920	MOS 480/960/1920	MOS 480/960/1920	MOS 480/960/1920	MOS 480/960/1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Three styles Opt. Opt. Std.	Three styles Opt. Opt. Std.	Three styles Opt. Opt. Std.	Three styles Opt. Opt. Std.	ASCII, data entry None Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std., up only Std. Std. Std. Std. 2 Std. Opt. Blink, underscore, double buffering, page swap	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std., up only Std. Std. Std. Std. 2 Std. Opt. Blink, underscore, double buffering, page swap	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std., up only Std. Std. Std. Std. 2 Std. Opt. Blink, underscore, double buffering, page swap	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std., only Std. Std. Std. Std. 2 Std. Opt. Blink, underscore, double buffering, page swap	L,R,U,D,H,Rt. Std. Std.; line only Std. Std. No Std. Std., up only No Std. Std. Std. No Opt. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact Opt. Operator I.D. card reader	None Impact Opt. Operator I.D. card reader	None Impact Opt. Operator I.D. card reader	None Impact Opt. Operator I.D. card reader	None Opt. None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS 232C interface Integral modem Telephone coupler	Half duplex Synchronous—BSC ASCII/EBCDIC 1200 to 9600 Block Std. No No	— — ASCII/EBCDIC 483,000 to 535,000 char. Block — — —	Half duplex Synchronous—BSC ASCII/EBCDIC 1200 to 9600 Block Std. No No	Half duplex Synchronous—BSC ASCII/EBCDIC 1200 to 9600 Block Std. No No	Half duplex Asynchronous ASCII 1200 to 4800 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— 984 to 3,978 36,000 to 141,500 — — — January 1974 — Courier, RCA, & Honeywell	— 1,924 to 7,816 68,500 to 279,350 — — — November 1973 — Courier, RCA, & Honeywell	— 133 to 147 4,700 to 5,050 — — — 2nd qtr. 1974 — Courier, RCA, & Honeywell	— 639 to 639 22,750 to 24,300 — — — 3rd. qtr. 1974 — Courier, RCA, & Honeywell	— 91/123 3050/4250 — 107 3,600 July 70/April 71 2000 Courier, RCA, & Honeywell
COMMENTS	Pricing includes controller and from 8 to 32 display units. Also see Report 70D-269-03.	Pricing includes controller and from 16 to 64 display units. Also see Report 70D-269-03.		Can support up to 4 devices including C270 displays, printer, auxiliary memory, and tape cassette unit.	Also see Report 70D-269-02.

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SUPPLIER AND MODEL	Courier Executerm 65 & 265	Courier Executerm 250	Courier Executerm 267	Datamedia Elite 1500	Datamedia Elite 2000
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone -- No No No Yes No	Cluster 32 No Yes No Yes No	Cluster 5 No No No Yes No	Stand-alone -- No Yes Yes No No	Stand-alone -- No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	480/960/1920 12 x 40; 12/24 x 80 4.8 x 6.4; 6 x 17 64 7 x 8 dot matrix	480/960/1920 6/12/24 x 80 6 x 17 64 7 x 8 dot matrix	960/1920 12/24 x 80 6 x 11 64 7 x 8 dot matrix	256/480/960/ 1440/1920 8 x 32; 6/12/18/24 x 80 1.5/3/4.5/6 x 9 64 5 x 7 dot matrix	960/1440/1920 12/18/24 x 80 3/4.5/6 x 9 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 480/960/1920	MOS 480/960/1920	MOS 960/1920	MOS 256/480/960/ 1440/1920	MOS 960/1440/1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII; data entry None Std. No	ASCII; data entry None Yes No	ASCII; data entry None Std. No	ASCII None Opt. Std.	ASCII None Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std.; line only Std. Std. No Std. Std., up only No Std. Std. Std. Std. No Opt. None	L,R,U,D,H,Rt Std. Std., line only Std. Std. No Std., up only No Std. Std. Std. Std. No Opt. None	L,R,U,D,H,Rt Std. Std., line only Std. Std. No Std., up only No Std. Std. Std. Std. No Opt. None	L,R,U,D,H No No No No No Std., up only No No No No Std. Opt. answerback and 20/60 ma. interface	L,R,U,D,H No No No No No Std., up only No Std. No No Std. Opt. answerback and 20/60 ma. interface
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Opt. None None	None Opt. None None	None Opt. None None	None Interface only None None	None Interface only None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 1200 to 4800 Block Std. No No	-- Local use only EBCDIC 300,000 Block -- -- --	Half duplex Asynchronous ASCII 1200 to 4800 Block Std. No No	Half/full duplex Asynchronous ASCII 110 to 4800 Character only Std. Opt., 1200 bps No	Half/full duplex Asynchronous ASCII 110 to 1800 Char./block Std. Opt., 1200 bps No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	-- 117/138 3,400/4,600 -- -- -- July 70/Apr. 71 Over 500 Courier, RCA, & Honeywell	-- 96 3,650 107 3,600 December 1972 Over 200 Courier, RCA, & Honeywell	-- 186 6,500 -- -- September 1973 -- Courier, RCA, & Honeywell	65 65 1,375 to 1,555 -- -- February 1972 Datamedia	75 75 1,775 to 1,895 -- -- September 1970 Datamedia
COMMENTS	Also see report 70D-269-02.	Also see report 70D-269-02.	Can support up to 4 devices including E-250 displays, printers, and memory for storing display formats. Also see Report 70D-269-02.	Also available as a monitor only.	

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SUPPLIER AND MODEL	Datamedia DMC 2100A	Datamedia Elite 2500	Data 100 Model 73	Datapoint 3000 & 3300	Datapoint 3360
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Cluster 64 No Yes No Yes No
DISPLAY ORGANIZATION Display positions, char/display Display format: lines x chars/line Display area: h x w, inches Displayable symbols Symbol formation	1440/1920 18/24 x 80 4.5/6 x 9 64 5 x 7 dot matrix	1920 24 x 80 6 x 9 128 5 x 7/9 dot matrix	960/1920 12/24 x 80 6 x 9 64 5 x 7 dot matrix	1800 25 x 72 7.5 x 10 64 5 x 7 dot matrix	2048 25 x 82 5 x 8 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1440/1920	MOS 1920	MOS 960/1920	MOS 1800	MOS 1048
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Opt. Std.	ASCII 11 Std. Std.	Teletype None Std. No	ASCII None Std. No	ASCII None Std. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H No Std. No No No Std. No No Std. No Std. No Std. No Std. No Std. Polling, loop- thru std.	L,R,U,D,H,Rt Std. Std. Opt. Opt. Opt. Std. Std., up only Std. Std. Std. Both std. 2 std. Std. Polling, limited graphics opt.	L,R,U,D,H Std. Std. No No No Std., up only Std. Std. Std. No No Std. No No None	L,R,U,D,H,Rt No No Std. No No Std. Std. No No Std. No No Std. None	L,R,U,D,H,Rt Opt. No Std. No No Std. Std., up only No No Std. No No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Interface opt. None None	None Interface std. None None	None Interface None None	Single drive opt. Nonimpact None None	None Nonimpact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-2320 interface Integral modem Telephone coupler	Full duplex Asyn./syn. ASCII 110 to 9600 Block Std. Opt., 1200 bps No	Half/full duplex Asyn./syn ASCII 110 to 9600 Char./block Std. Opt., 1200 bps No	Half duplex Asynchronous ASCII 110 to 1200 Character Std. No No	Half/full duplex Asynchronous ASCII 110 to 2400 Character Opt. No Opt.	Half/full duplex Asynchronous ASCII 300 to 4800 Block Std. No Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 2,035 to 2,095 — — — October 1972 Over 350 Datamedia	85 to 95 85 to 95 2,080 — — — July 1973 — Datamedia	— — 3,750 to 3,950 — — — August 1970 — Data 100	— — 2,400 to 3,240 — — — 1968/1970 5,500 Datapoint	— — 2,900 — — — January 1970 400 Datapoint
COMMENTS	Newer version of Elite 2100; avail- able with 12- inch CRT monitor.	Print buffer optional.	Switch-selectable speeds.	Cassette recorder for 3300 only; Model 3000 (newer) operates at up to 300 bps.	Switch-selectable speeds.

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SUPPLIER AND MODEL	Datapoint 1100	Delta Data 5000/APL, 5100, 5200 & 5500	Delta Data Model 5300	Digi-Log Model 209 TeleComputer	Digi-Log Model 33
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes Yes Yes Yes Yes	Either 95 No Yes Yes Yes No	Either 95 Yes Yes No Yes Yes	Stand-alone 10 No No Yes No No	Stand-alone 10 No No Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	960 12 x 80 3.5 x 7 94 5 x 7 dot matrix	2160 to 3072 27 x 80 6 x 11 64; 96 opt. 7 x 9 dot matrix	2160 27 x 80 6 x 11 64 7 x 9 dot matrix	640 16 x 40 Variable 64 5 x 7 dot matrix	1280 16 x 80 Variable 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 4K to 8K	MOS 3072	MOS 2160	MOS 640	MOS 1280
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Std. No	Teletype Opt. Std. Opt.	Teletype None Yes Opt.	Teletype None None No	Teletype None None No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std., up only No No No No No Std. None	L,R,U,D,H,Rt Std., except 5100 Std. Std. Std., except 5100 Std., except 5100 Std. Std., up/down Std. Std. Std. Std. Std. Std. Paging, scrolling	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Up and down Std. Std. Std. Std. Std. Std. Paging	L,R,U,D,H,Rt No Opt. Opt. No No No Std., up only No No Std. Opt. No Opt. None	L,R,U,D,H,Rt No Opt. Opt. No No No Std., up only No No Std. Opt. No Opt. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Dual drive std. Impact/nonimpact None Card reader	Single/dual drive Impact/nonimpact No Yes	Single/dual drive Impact/nonimpact Opt. Std.	Interface Interface None None	Interface Interface None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. Programmable Up to 9600 Character Opt. Opt. Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. Opt. Opt.	Half/full duplex Asyn./syn. EBCDIC/ASCII 1200; 2400 opt. Char./block Std. Opt. Opt.	Half/full duplex Asynchronous ASCII 75 to 9600 Character Std. Opt. Opt.	Half/full duplex Asynchronous ASCII 75 to 9600 Character Std. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 4,670 to 8,040 — — — January 1974 — Datapoint	— — 3,000 to 4,500 — — 3,000 to 4,000 1970 1,600 Delta Data & GE	— — 5,000 to 5,600 — — 3,000 to 4,000 1970 200 Delta Data & GE	— — — — — 1,195 to 1,695 September 1972 800 Digi-Log	— — — — — 1,295 to 1,720 September 1972 400 Digi-Log
COMMENTS	Operates under control of stored software.	Clustered via Multi-Term 2 family of remote multiplexers; rates up to 3.5 million bytes/second.	Clustered via Multi-Term 2 family of remote multiplexers; rates up to 3.5 million bytes/second.	Portable (10 lbs.) controller uses video monitor or conventional TV set for display.	Portable (10 lbs.) controller uses video monitor for display.

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SUPPLIER AND MODEL	Digi-Log Series 300	Digi-Log Series 3300 Microterm	Digital Equipment Model VT05	Digital Equipment Model GT40	Four-Phase Systems System IV/40
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone 10 No No Yes No No	Stand-alone — Yes, by vendor No Opt. Opt. Opt.	Stand-alone — No Yes Yes No No	Stand alone — Yes Yes Yes No No	Cluster 16 Yes No Yes Yes Yes
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	640/1280 16 x 40/80 Variable 63 5 x 7 dot matrix	1920 24 x 80 max. Variable 128 5 x 7/5 x 9/ 7 x 9 dot matrix	1440 20 x 72 6.25 x 8 64 5 x 7 dot matrix	2432 31 x 72 6.75 x 9 127 6 x 8 dot matrix	1152/1920 24 x 48/80 7.25 x 10.25 125 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 640/1280	MOS 16K	MOS 1440	Core 2432	MOS 1152/1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	— — — —	Typewriter 10 opt. Opt. Opt.	ASCII None None No	ASCII None None Std.	ASCII; data entry 12 Std. Std.
FEATURES Cursor control; Left, Right, Up Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt No Std. Opt. No No No Std., up only No No No Opt. No Opt. —	L,R,U,D,H,Rt Std. Std. Opt. Std. Std. Std. Std., up only Std. Std. Std. Std. 2 std. Opt. — Word wraparound, underscore, reverse video	L,R,U,D,H Std. Std. Std. No Std. Up only No No No No No Std. No Std. None	L,R,U,D,H Std. Std. Std. No No Std. Std. Up only No No No Std. 8 Yes Vector generation	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 3 opt. Opt. Format storage
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Interface Interface None None	Opt. Opt. None Opt.	None Interface None None	Dual drive Interface Std. Yes, PDP-11 peripherals	None Impact None Disk drive, diskette
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 75 to 9600 Char./block Opt. Opt. Opt.	Half/full duplex Asynchronous ASCII Up to 2400 Character Std. No Opt.	Half/full duplex Asynchronous ASCII Up to 9600 Character Std. No Opt.	Half/full duplex Asyn./syn. ASCII/EBCDIC 9600 Char./block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — — — — 790 to 1,100 March 1974 — Digi-Log	— — 1,700 to 2,100 — — September 1973 Over 300 Digi-Log	— — 2,795 — — November 1971 2,000 Digital Equipment	— — 13,400 to 15,695 — — September 1972 200 Digital Equipment	41 36 (5 yr.) 1,845 350 308 (5 yr.) 17,325 July 1973 1,000 Four-Phase
COMMENTS	Portable (10 lbs.) controller without keyboard uses conventional TV set or video mon- itor for display.	Microprocessor construction; ROM microprogram storage; opt. 20/60 ma. interface; designed to user's specifications.		Graphic terminal; vector generation and alpha- numericals.	Includes minicom- puter and variety of peripherals. Also see Report 70D 435-02.

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SUPPLIER AND MODEL	Four-Phase Systems System IV/70	GTE Information Systems IS/7801 & IS/7802	GTE Information Systems IS/7805	GTE Information Systems S/7700 & IS/7701	GTE Information Systems IS/7100
ARRANGEMENT Stand-alone or clutter Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 32 Yes Yes Yes Yes Yes	Cluster 28 Yes, by vendor IS/7802 only No No Yes	Stand-alone -- Yes, by vendor No No No Yes	Cluster 24 No IS/7701 Yes No	Stand-alone -- No No No Yes No
DISPLAY ORGANIZATION Display positions, char/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1152/1920 24 x 48/80 7.25 x 10.25 125 7 x 9 dot matrix	240/480/960/ 1920 6/12 x 40; 12/24 x 80 7.5 x 9.5 128 5 x 7 dot matrix	240/480/960/ 1920 6/12 x 40; 12/24 x 80 7.5 x 9.5 128 5/10 x 7 dot matrix	240/480/960/ 1920 6/12 x 40; 12/24 x 80 7.5 x 9.5 64 5 x 7 dot matrix	240/480/960/ 1920 6/12 x 40; 12/24 x 80 7.5 x 9.5 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1152/1920	MOS 240/480/960/ 1920	MOS 240/480/960/ 1920	MOS 240/480/960/ 1920	MOS 240/480/960/ 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII; data entry 12 Std. Std.	See Comments 12 std. Std., data entry Std.	See Comments 12 std. Std., data entry only Std.	ASCII; data entry None None Std.	ASCII; data entry None None Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blanking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 3 opt. Opt. Format storage	L, R, U, D, H Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 std. Std. Limited graphics opt.; fractions std.	L, R, U, D, H Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 std. Std. Limited graphics opt.; fractions std.	L, R, U, D, H Std. No No Std. No No No Std. Std. Std. Std. No Std. No None	L, R, U, D, H Std. No No No No No No Std. Std. No No No No No None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact None Card reader, disk and tape drives	None Impact/non- impact Opt. ID card reader, opt.	None Impact/non- impact Opt. ID card reader opt.	None Impact/non- impact None None	None Impact/non- impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII/EBCDIC 9600 Char./block Opt. No No	Half duplex Synchronous (BSC) ASCII; EBCDIC 1200 to 9600 Block Std. No No	Half duplex Synchronous (BSC) ASCII; EBCDIC 1200 to 9600 Block Std. No No	Half duplex Asynchronous ASCII 1200 to 9600 Block Std. No No	-- Local use only EBCDIC 55,000 cps Character -- -- --
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Served by	41 36 (5-yr.) 1,845 595 523 (5-yr.) 25,025 February 1971 10,000 Four-Phase	70 to 115 -- 1,850 to 3,050 155 8,700 February 1974 -- GTE/IS	130 to 150 -- 5,700 to 7,100 -- -- February 1974 -- GTE/IS	-- -- 37,576 to 55,576 -- -- April 1972 -- GTE/IS	-- -- 37,576 to 55,560 -- -- June 1972 -- GTE/IS
COMMENTS	Includes mini-computer and variety of peripherals. Also see Report 70D-435-01.	Three keyboards available: Type-writer, Data Entry, Console.	Three keyboards available: Type-writer, Data Entry, Console.	Supports up to 12 buffered printers at 30 to 165 cps.	Supports up to 12 buffered printers at 30 to 165 cps.

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SUPPLIER AND MODEL	GTE Information Systems IS/7000	Hazeltine 1000	Hazeltine Model 2000	Hazeltine 3000	Hendrix EDS 5200/5200B
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No No No Yes No	Stand-alone — No No Yes No No	Stand-alone — No No Yes No No	Either 16 Yes, by vendor Yes No No No	Stand-alone — No Yes No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	960 12 x 80 7.5 x 9.5 64 5 x 7 dot matrix	960 12 x 80 — 64; 96 opt. 5 x 8 dot matrix	1998 27 x 74 6.5 x 8.5 64 5 x 7 dot matrix	1998 27 x 74 — 64; 96 opt. 5 x 7 dot matrix	3072 32 x 96 17 (diagonal) 128/226 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	Delay line 960	MOS 960	MOS 2048	MOS 1998	MOS 3072
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII; data entry None None Std.	Teletype None None No	Teletype None Std. Std.	Teletype None Std. Std.	Typesetting None None No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H Std. No No No No Std. No No Std. No No No No No None	R,D,H No No No No No Std. No No No No No No No No None	L,R,U,D,H,Rt Std. Std. No Std. Std. Std. Std. Std. Std. Std. Std. 2 std. Std. None	L,R,U,D,H Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Opt., field only 2 std. Std. None	L,R,U,D,H Yes Yes Yes Yes Yes Yes Yes, up and down No Yes Yes No 2; 4 opt. No
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact/nonimpact None None	None None None None	Dual drive Impact/nonimpact None None	Dual drive Impact/nonimpact None Remote monitors	None None None Papertape reader/punch std.
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 1200/2400 Block Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Character only Std. No Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. Opt. No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Block only Std. No Opt.	Half duplex Asynchronous TTS/ASCII 110 to 9600 Character only Std. Std. 5200 only No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 4,880 — — — December 1969 Over 2,000 GTE/IS	49 — 1,750 — — — June 1973 — Syntonic	88 — 2,995 — — — October 1970 — Syntonic	125 110 3,900 50 to 75 — 1,200 to 1,800 — — Syntonic	— — 11,900 to 14,900 — — — 1970 — Hendrix
COMMENTS	Marketed on as-available basis. Also see Report 70D-874-01.	Available with auxiliary RS 232 and current loop interfaces. Also see Report 70D-471-01.	Also see Report 70D-471-01.	Controller is available with 8 or 16 ports; micro-programmable.	

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SUPPLIER AND MODEL	Hendrix EDS 5700	Hendrix CDS/4000	Hewlett-Packard 2615A	Hewlett-Packard 2616A	Honeywell VIP 7500
ARRANGEMENT Stand alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 8 or 16 Yes Yes Yes No No	Stand alone — Yes No Yes Yes Yes	Stand alone — No No Yes No No	Stand alone — No No Yes No No	Stand alone — Yes Yes Yes No Yes
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1296 18 x 72 12 (diagonal) 192 7 x 9 dot matrix	960 12 x 80 3.5 x 7 94 5 x 7 dot matrix	2000 25 x 80 12 (diagonal) 64 5 x 7 dot matrix	2000 25 x 80 12 (diagonal) 96 5 x 7 dot matrix	960 12 x 80 3.5 x 7 94 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1296	MOS 960	MOS 2000	MOS 2048	MOS 4K to 8K
KEYBOARD Type Program function keys Numeric keygroup Detachable	Typesetting None None No	ASCII 2 No No	Teletype None None Std.	Teletype 8 std. Std. Std.	ASCII None Yes No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H Yes Yes Yes Yes Yes Yes Yes, up and down Yes Yes Yes Yes 4 Std.	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std., up only No No No No No Std. None	L,R,U,D,H No No Std. No No Std. Std., up only No No Std. No No Std. None	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std., up/down No Std. Std. Std. Std. Std. Reverse video, scrolling (line/ page), and non- spacial mem.	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std., up only No No No No No No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact None Paper tape reader/ punch std.; disc; OCR	Dual drive Impact/nonimpact None Card reader, disk and tape drives	None None None None	None Impact None None	Dual drive Impact None Disk drive, 2.5M bytes
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. TTS/ASCII 110 to 9600 Character only Std. Std. Std.	Half/full duplex Asyn./syn. ASCII/EBCDIC 2000 to 9600 Character Opt. Opt. Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Character Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. Programmable 110 to 9600 Character Opt. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 6,500 — — 21,900 1972 — Hendrix	— — 12,300 to 18,000 — — — June 1972 — Hendrix	Contact HP Contact HP 2,750 — — — March 1974 — Hewlett-Packard	Contact HP Contact HP 4,500 — — — March 1974 — Hewlett-Packard	128 108 (3-yr.) 3,990 301 to 649 250 to 536 (3-yr.) 9,800 to 20,900 — — Honeywell
COMMENTS		Manufactured by Datapoint as the Datapoint 1100.	Manufactured by Beehive Terminals; purchase price for four or more units is \$2,450.	Manufactured by Beehive Terminals; purchase price for four or more units is \$4,100.	Manufactured by Datapoint as the Datapoint 1100.

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SUPPLIER AND MODEL	IBM 2260 Display Station	IBM 2265 Display Station	IBM 3790 Communication System	IMLAC PDS-1G	IMLAC PDS-4
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 24 No Yes No Yes No	Stand-alone — No No No Yes No	Cluster 16 Yes No No No No	Either 4 Yes Yes Yes Opt. Opt.	Either 4 Yes Yes Yes Opt. Opt.
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	240/480/960 6/12 x 40; 12 x 80 4 x 9 64 5 x 7 dot matrix	960 15 x 64; 12 x 80 4,6 x 10.3 64 Stroke	480/1920 12 x 40; 24 x 80 14 (diagonal) 64 7 x 9 dot matrix	140; 1900 opt. User-specified 9 x 10 128 Stroke	3000; 4000 opt. User-specified 10 x 11; 13 x 14 opt. 96 Stroke
REFRESH MEMORY Type Capacity, characters	Core 240/480/960	Core 960	MOS 480/1920	Core 4K to 32K (16-bit words)	Core 4K to 32K 16-bit words)
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII; numeric None Opt. Std.	Typewriter None None Std.	Typewriter None Std. Std.	Teletype 6 std. Opt. Std.	Teletype 6 std. Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D. Opt. Line only No No No Opt. No Std. Std. No Std. Std. No No No No No None	L,R,U,D Std. Line only No No No No No Std. Std. No Std. Std. No No No No No None	L,R,U,D Std. Std. No Std. No Std. Std. No Std. Std. No 2 std. Opt. Operator ID card reader	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Both std. 16 opt. Opt. Vector generation	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Both std. 16 std. Opt. Vector generation
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None IBM 1053 None None	None IBM 1053 None None	None IBM 3793 Opt. Operator I.D. card Recorder	Opt. Opt. Opt. Magnetic tape and disc drives; punched tape reader/punch	Opt. Opt. Opt. Magnetic tape and disc drives, punched tape reader/punch
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 1200/2400 Block Std. No No	Half duplex Asynchronous ASCII 1200/2400 Block Std. No No	Half duplex Synchronous-SDLC EBCDIC 1200/2400 Block Opt. Opt. No	Half/full duplex Asyn./syn. Any 75 to 200,000 Char./block Std. No Opt.	Half/full duplex Asyn./syn. Any 75 to 200,000 Char./block Std. No Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 1,270 to 2,140 — — 15,715 to 86,365 June 1966 — IBM	— — 6,330 — — 8,295 to 12,200 April 1969 — IBM	See Comments See Comments See Comments — — — 1st qtr. 1975 — IBM	330 330 7,500 — — — December 1973 300 IMLAC	612 612 13,900 — — — December 1973 300 IMLAC
COMMENTS	Also see Report 70D-491-05.	Also see Report 70D-491-06.	Remote shared- processor data entry system. Pricing is complex and depends upon the system con- figuration; see Report 70D-491- 42 for details	An interactive graphics terminal that features a microcomputer and software support including a FORTRAN IV compiler	An interactive graphics display system that features a mini- computer and soft- ware support in- cluding a FORTRAN IV compiler

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SUPPLIER AND MODEL	Incoterm SPD 10/20	Incoterm SPD-900	Incoterm SPD 20/20	Incoterm SPD 320	Information Displays IDI/OM/II
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes No Yes Yes No	Stand-alone — Yes No Yes Yes No	Cluster 64 Yes No Yes Yes No	Cluster 8/16 No No No No Yes	Either 6 Yes Yes No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920 30 x 64 6.5 x 9 121 7 x 10 dot matrix	1920 30 x 64 6.5 x 9 121 7 x 10 dot matrix	960/1920 12/24 x 80; 15/30 x 64 6.5 x 9 121 7 x 10 dot matrix	480/960/1920 12 x 40, 12/24 x 80 6.5 x 9 7 x 10 dot matrix	6000 94 x 128 13 x 13 8300 Stroke; 16/char.
REFRESH MEMORY Type Capacity, characters	Core 1920	Core 448	MOS 8K to 32K	MOS 1920	Core Up to 32K x 16 bits
KEYBOARD Type Program function keys Numeric keygroup Detachable	Several available 24 Opt. Std.	Several available 24 Opt. Std.	ASCII; EBCDIC 24 Opt. Std.	Several available 24 Opt. Std.	ASCII 32 Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Both opt. No Opt. None	L,R,U,D,H,Rt Std. Std. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Both opt. No Opt. None	L,R,U,D,H,Rt Opt. Std. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Both opt. 2 std. Opt. —	L,R,U,D,H,Rt Std. Std. Std. Std. Opt. Std. No Std. Std. Both std. 2 std. Opt. —	Omnidirectional Opt. Opt. Std. Std. Opt. Opt. Opt. Opt. Std. Std. 4 std. No Protected fields
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single/dual drive Impact None Floppy disk drive	Single/dual drive Impact None Floppy disk drive, card reader, card punch	Single/dual drive Impact None Diskette drive, card readers, punch, 7-/9-tk. mag. tape drives	— Impact None Diskette drive	Opt. Opt. Std. Opt.
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII/EBCDIC 50 to 9600 Char./block Std. No No	Half/full duplex Synchronous-BSC EBCDIC 1200 to 9600 Block Std. No No	Half/full duplex Asyn./syn. ASCII Up to 9600 Block Opt. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	195 192 5,800 — — — 1970 Over 2,000 Incoterm	— 286 to 539 12,400 to 23,400 — — — June 1973 — Incoterm	Contact Incoterm — Contact Incoterm Contact Incoterm — Contact Incoterm — Incoterm	Contact Incoterm — Contact Incoterm Contact Incoterm — Contact Incoterm — Incoterm	— 2,335 66,000 — — — 1969 50 IDI
COMMENTS	Extensive software support includes emulators and assemblers; up to 32 displays per line via multiplexer. Also see Report 70D-495-01.	Supported as RJE terminal via emulation programs for popular batch terminals. Also see Report 70D-495-02.		One printer per display multiplexer accommodates 4 to 16 SPD 320 controllers for up to 256 displays and attached printers.	

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SUPPLIER AND MODEL	Information Displays IDigraf	Infoton Vistar/GT	Infoton Vistar	Infoton Vista Plus	International Computers Ltd. Model 7181/2
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Either 4 Yes Yes No No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Either 64 No Yes No No No	Either 26 No Yes No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	3000 52 x 74 10 x 10 3800 StroKe; 16/char.	1920 24 x 80 9 x 7 63 5 x 7 dot matrix	1920 24 x 80 9 x 7 63 5 x 7 dot matrix	400/800/1600 10/20 x 40/80 5.5 x 8.7 96 5 x 7 dot matrix	2000 25 x 80 6.9 x 10.4 96 10 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1K to 8K	MOS 1920	MOS 1920	MOS 400/800/1600	Delay line 2000
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII 10 opt. Opt. No	Teletype None None No	Teletype None Std. No	ASCII None Std. No	ASCII None Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	Omnidirectional Opt. Std. Std. Std. Opt. Opt. Opt. No Std. Opt. Opt. Std. 2 std.; 4 opt. No Protected fields	Rt. No No Std. No No Std. No Std. No Std. No Std. No Std.	L,R,U,D,H,Rt No No Std. No No Std. No Std. No Std. No Std. No Std. None	L,R,U,D,H,Rt Std. No Std. Std. Std. No Opt. Std. Std. Std. Both std. Std. Polling opt.	L,R,U,D,H,Rt Std. Std. Opt. Std. Std. Std. Opt., up only Std. Std. Std. Std. No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Opt. Opt. Opt. Opt.	None None None None	None None None None	None Interface opt. Opt. Concentrator	None Impact None Teletype ASR; badge reader
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 9600 Char./block opt. Opt. Opt. Opt.	Half/full duplex Asynchronous ASCII 75 to 9600 Character only Std. No No	Half/full duplex Asynchronous ASCII 75 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 4800 Block Std. No No	Half/full duplex Synchronous ASCII 600 to 4800 Block Yes No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 4,000 — — 4,500 1972 50 IDI	— — 1,595 — — — December 1973 500 Infoton	— — 2,295 — — — February 1973 2,000 Infoton	— — 3,395 — — — July 1971 2,000 Infoton	— — Contact ICL — — — Contact ICL 1971 — ICL
COMMENTS		Switch-selectable speeds; 20/60 ma. current loop interface also std.	Switch-selectable speeds; 20/60 ma. interface also std.	Switch-selectable speeds; 8-channel concentrator expandable to 64 channels.	

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SUPPLIER AND MODEL	International Computers Ltd. Model 7181/4	ITT Model 3100 Alphascope	ITT Model 3501 Asciscope	Jacquard 100 & 105	Kustom MCT-10
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 240 No Yes No No No	Either 32 No Yes No Yes No	Stand-alone — No No Yes No No	Either 32 Yes, 100 only Yes, 100 only Yes, 100 only No Yes, 100 only	Stand-alone — No Yes No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	2000 25 x 80 6.9 x 10.4 96 10 x 7 dot matrix	240/480/960/ 1360/1920 6/12 x 40; 12/17/24 x 80 5.5 x 8 to 10 x 16 65 5 x 7 dot matrix	960 12 x 80 5 x 8 65 5 x 7 dot matrix	1920 24 x 80 12 (diagonal) 64 5 x 7 dot matrix	256 8 x 32 3.38 x 9.18 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	Delay line 2000	Delay line/MOS 240/480/960/ 1360/1920	MOS 960	MOS 2K to 128K	MOS 256
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Opt. Yes	ASCII 5 Opt. No	Teletype None None No	ASCII 8 std. Std. Std.	Typewriter 11 std. None No
FEATURE Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Opt. Std. Std. Std. Std. Opt., up only Yes Yes Yes Yes No Yes None	L,R,U,D,H,Rt Std. Std., line Std. Std. No Std. Std. Opt. Std. Std. Std. No No Std. None	L,R,U,D,H,Rt No Std. Std. No No Std. Std. No Std. Std. Std. No No Std. None	L,R,U,D,H,Rt. Std. Std. Opt. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. No No Opt. —	L,R,U,Rt No No Std. No No No No Std. No No No Std. No Std. —
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact None Teletype ASR; badge reader	None Impact/non-impact None None	Interface Interface None None	No Yes, 100 only Opt., 100 only None	None Non-impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	— Direct connection ASCII Up to 1,000,000 Block — — —	Half duplex Asynchronous ASCII 1200 to 4800 Block Std. No No	Half/full duplex Asynchronous ASCII 110 to 2400 Char./block Std. Std. Std.	Half/-full duplex Asyn./syr. ASCII 134 to 9600 Char./block opt. Std. No Opt.	Full duplex Synchronous ASCII 1300 Block No Std. No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — Contact ICL — — Contact ICL 1971 — ICL	— — 1200 to 2,500 — — 6,150 to 28,000 September 1970 1500 (USA) ITT	65 — 2,195 — — — October 1972 700 ITT	— 63 (105) 1,300 (105) — 194 (100) 4,000 (100) March 1974 — Jacquard & Sirvess	152 107 3,200 — — 27,500 to 90,000 March 1972 160 Kustom
COMMENTS	For direct connection to an ICL 1900 series computer via an ICL 7180/2 Controller.	Also see Report 70D-538-02.	Also see Report 70D-538-01.	Model 100 (master unit) contains a microprocessor and accommodates Model 105's (slave units).	Mobile terminal has plasma display; communication via 2-way radio, for mobile use.

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SUPPLIER AND MODEL	NCR 796-101	NCR 796-201	NCR 796-301	Olivetti DE 520	Olivetti TCV 270
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No No Yes No No	Stand-alone — No No Yes No No	Stand-alone — No No No No No	Stand-alone — Yes No No No No	Either 32 Yes No No Yes Yes
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920 24 x 80 8 x 10 64 5 x 7 dot matrix	1920 24 x 80 8 x 10 64 5 x 7 dot matrix	1920 24 x 80 8 x 10 64 5 x 7 dot matrix	341 11 x 31 4.75 x 5.5 64; 96 opt. 5 x 7 dot matrix	480/1920 12 x 40; 24/80 12 (diagonal) 96 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1920	MOS 1920	MOS 1920	MOS; 5K to 12K	MOS 480/1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype-ASCII None Std. No	Teletype-ASCII None Std. No	Teletype-ASCII None Std. No	Typewriter None Std. No	Data entry-ASCII 12 opt. Opt. Std.
FEATURES Cursor controls; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H No Std. Opt. No No No Opt. No No Std. No Std. No Std. No Std. None	L, R, U, D, H Std. Std. No Std. No No Opt. No Std. Std. Both Std. 2 Std. No Vector generation; 72 x 160 dots	L, R, U, D, H Std. Std. No Std. No No Opt. No Std. Std. Std. 2 Std. No Vector generation; 72 x 160 dots	L, R, H, Rt Std. Std. Std. No No Std. No No Std. Std. Std., char. only No Std. None	L, R, U, D, H, Rt Std. Std. Std. Std. Std. Std., up only Std. Std. Std. No 2 std. Std. See Comments
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Non-impact None None	None Non-impact None None	None Non-impact None None	Single/dual drive Impact None Card reader; 7-/9- track tape; punched tape reader/punch	None Impact Opt. Operator I.D. card reader
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 9600 Character only Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. Opt. Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half duplex Asyn./syn. ASCII/EBCDIC 600 to 4800 Block Opt. No No	Half/full duplex Asyn./syn. ASCII/EBCDIC 1200 to 4800 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	80 80 2,000 — — — January 1974 Over 100 NCR	130 130 3,000 — — — January 1974 — NCR	150 150 3,500 — — — February 1974 — NCR	165 to 350 157 to 332 6,100 to 14,000 — — — February 1971 Over 7,000 Olivetti	99 to 233 — 3,620 to 8,130 101 to 172 — — 2,525 to 5,500 May 1974 — Olivetti
COMMENTS	Available with NCR 260 RO printer; Manufactured by ADDS as Model 580	Available with NCR 260 RO printer; manufactured by ADDS as Model 880.	Up to 96 CRT's can be daisy- chained on a single line; man- ufactured by ADDS as Model 880A	Manufactured by Sycor, Inc. as Model 340; uses Olivetti TPS assembler-type language.	Options include 6K RAM, check- digit verification, and arithmetic and logical operations

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SUPPLIER AND MODEL	Omron 8525A	Ontel 4000 Series	Pertec Model 71	Plantronics ComSet DS-150	Princeton Electronics Model 801
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes, by vendor Yes Yes No Opt	Stand-alone — No Yes Yes No No	Stand-alone — Yes Yes No No No	Stand-alone — No No Yes No No	Stand-alone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920; 3820 opt. 24 x 80 8 x 10 128; 224 opt. 7 x 9 dot matrix	1600 20 x 30 7 x 10 112 7 x 9 dot matrix	960/1920 12/24 x 80 5.5 x 8.25 64; 96 opt. 7 x 9 dot matrix	64 4 x 16 3 (diagonal) 64 5 x 7 dot matrix	2048/3698/8192 See Comments 10 x 10 96 7 x 11 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1920; 3820 opt.	MOS 1600/3200/6400	MOS 960/1920	MOS 64	Storage tube —
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII 7 std. Std. No	ASCII/APL None Std. Std.	ASCII 5; 11 opt. Opt. Std.	Touch-Tone; 12 key None 10 keys No	ASCII 5; 16 opt. None Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt. Std. Std. Std. Std. Std. Std. Std., up only Std. Std. Std. Std. Std. 2 std. Opt. Scroll by line or page std.	L, R, U, D, H, Rt. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. 2 std. Std. Vector generation	L, R, U, D, H Std. Std. Std. Std. Std. Std. No Std. Std. No 2 std. Std. Protected fields, page mode	No cursor No No No No No No No No No No No No —	L, R, U, D, H, Rt No Std. No Delete only Delete only Std. Opt., up only No No Std. No No Std. Vector generation, selective erase
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single/dual drive Impact None Contact Omron	Single/dual drive Impact None Monitor; punched tape reader/punch	None Impact None None	None None None None	Single drive None None Joy stick & zoom control
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. opt. ASCII 110 to 2400 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII/EBCDIC 110 to 9600 Char./block Std. No No	Half duplex Asyn./syn. ASCII 110 to 9600 Block Std. Opt. No	Half duplex Asynchronous ASCII/DTMF Up to 300 Character Std. No No	Half/full duplex Asyn. ASCII 110 to 2400 Character Opt. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 2,450 to 13,600 — — — December 1973 — Western Union	— — 2,975 to 3,470 — — — April 1971 200 Ontel & GTEIS	— — 1,750 — — — April 1974 — Pertec	See Comments — — — — — April 1973 Over 300 Local tel. co.	— — 7,950 to 12,000 — — — October 1972 — Princeton
COMMENTS		Communications discipline com- patible with Burroughs CRT terminals; micro- processor control.	OEM only.	Leased to user by local telephone co. for about \$25 to \$30 per month; unit attaches directly to tele- phone set	Special alpha- numeric/graphic terminal with three screen formats: 32 x 64, 43 x 86, and 64 x 128.

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SUPPLIER AND MODEL	Quotron 800 Series	Raytheon PTS-100	RCA Custom Terminal Systems Flexiterm	Research Telera 3311	Research Telera 3712
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 24/64 Yes No No No Opt.	Either 96 Yes Yes Yes Yes Yes	Stand-alone — Yes No ? Opt. Opt.	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol format	960/1920; 800/ 1200/1600 12/24 x 80; 10/20 x 80; 20 x 60 6 x 8 96 16 x 20 dot matrix	480/9600/1920 12 x 40/80; 24 x 80 7 x 10 64, 96 opt. 7 x 9 dot matrix	Up to 1920 Up to 24 x 80 ? 64 ?	1920 24 x 80 7.5 x 9.5 64 5 x 7 dot matrix	1920 24 x 80 7.5 x 9.5 96 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS/core 8K to 64K	MOS 512/1024/2048	MOS 1920	MOS 1920	MOS 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII 11 Opt. Std.	ASCII Yes No Std.	Several available ? ? ?	Teletype None Opt. Opt.	Teletype None Std. Opt.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Std. Both Std. No Opt. None	L,R,U,D,H,Rt Std. Std. No Std. No Opt. Opt. Opt. Opt. Std. Std. Std. Std. Opt. Opt. None	Full range Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Reverse video, validity checks, range checks	D,H,Rt No No No No No No Std., up only No No Std. No Std. No Std. None	L,R,D,H,Rt No No No No No No Std., up only No No Std. No No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single drive Impact None Disk drives, card reader, magnetic tape drives punched tape	4 drives Impact None Card reader; disk; punched tape reader/punch; TTY	None Available None Reader for embossed cards	Yes None None None	Yes None None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII/EBCDIC/ BCD 110 to 9600 Char./block Std. No Opt.	Half/full duplex Asyn./syn. ASCII/EBCDIC Up to 9600 Char./block Std. Opt. No	Half/full duplex Asyn./syn. Several ? ? Std. ? ?	Half/full duplex Asynchronous ASCII 110 to 2400 Character Std. No Opt.	Half/full duplex Asynchronous ASCII 110 to 9600 Character Std. No Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	Contact Quotron — Contact Quotron Contact Quotron Contact Quotron Contact Quotron Contact Quotron January 1971 5,000 Quotron	— — 4,800 to 70,000 — — — September 1972 — Raytheon	— — 5,000 to 6,800 — — — ? ? RCA	65 60 1,580 to 1,680 — — — February 1972 Over 500 Research, Inc.	79 72 1,880 to 1,980 — — — February 1974 — Research, Inc.
COMMENTS	Clustered terminal systems built around a free- standing mini- computer	Controlled by minicomputer. Also see Report 70D-710-01	Terminal built around 16-bit RCA microprocessor; not a standard product line; RCA intends to provide custom- ized versions tailored to customer needs.		

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SUPPLIER AND MODEL	Research Telera 3301	Sanders 720 Data Display System	Sanders 620 & 622 Data Display Systems	Sanders 804 System	Sanders 810 System
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Cluster 12 No Yes Yes Yes No	Stand-alone — No No Yes Yes No	Stand-alone — Yes No No Yes No	Cluster 8 Yes No No Yes No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	960 12 x 80; 24 x 40 7.5 x 9.5 64 5 x 7 dot matrix	2000 40 x 52; 32 x 64/84 7.5 x 9.5 64 Stroke	2000 40 x 52; 32 x 64/84 7.5 x 9.5 64 Stroke	960/1920 12/24 x 80; 15 x 64 7.5 x 9.5 96 5 x 7 dot matrix	960/1920 12/24 x 80; 15 x 64 7.5 x 9.5 96 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 960	Delay line 250/512/1024	Delay line 780/1024	MOS 960/1920	MOS 960/1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype None Opt. Opt.	ASCII None Opt. Yes	ASCII None None Yes	ASCII Opt. Opt. No	ASCII 10 - 24 Yes No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	D,Rt,H No No No No No Up only No No Std. No Std. Std. No Std.	L,R,U,D,H,Rt Std. Std. Std. Std. Std. No Opt. Std. Std. Std. 2 std. No None	L,R,U,D,H,Rt Std. Std. Std. Std. Std. No No Std. Std. Std. 2 std. No None	L,R,U,D,H,Rt Opt. Std. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. No Opt. None	L,R,U,D,H,Rt Opt. Opt. Std. Opt. Opt. Opt. Opt. Opt. Opt. Opt. Opt. No Opt. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None None None None	None Impact Opt. None	None Impact None None	Dual drive Impact None Card reader	Dual drive Impact None Card reader, disk drive
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 2400 Character Std. No Opt.	Half duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Half duplex Asyn./syn. ASCII 110 to 2400 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII/EBCDIC/ BCD 110 to 9600 Char./block Std. Opt. No	Half/full duplex Asyn./syn. ASCII/EBCDIC 110 to 9600 Char./block Std. Opt. No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 1,520 to 1,620 — — — February 1972 Over 100 Research, Inc.	— — 3,177 to 3,277 — — 7,088 to 18,000 1966 — Sanders	— — 5,670 to 13,455 — — — 1968/1970 — Sanders	215 to 420 195 to 382 (3 yr.) 6,055 to 11,115 — — — December 1971 — Sanders	65 to 68 59 to 62 (3-yr.) 1,525 to 1,615 192 to 647 175 to 584 (3 yr.) 8,100 to 22,820 January 1973 — Sanders
COMMENTS				Also see Report 70D-734-01.	Also see Report 70D-734-01.

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SUPPLIER AND MODEL	Sanders 8040/8041	Sanders 8100 System	Sanders 8170 System	Scientific Management Systems SMS 1440	I. P. Sharp IPSA 100
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes No No No No	Cluster 4 Yes No No No No	Cluster 32 Yes No No No Yes	Stand-alone — No Yes Yes No No	Stand-alone — No No No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920 24 x 80 7.5 x 9.5 64 5 x 7 dot matrix	1920 24 x 80 7.2 x 9.6 96 5 x 7 dot matrix	480/960/1920 12 x 40/80; 24 x 80 7.2 x 9.6 96 5 x 7 dot matrix	1440 18 x 80 12 (diagonal) 64 5 x 7 dot matrix	256/512 8/16 x 32 Variable 89 APL 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1920	MOS 1920	MOS 480/960/1920	MOS 1440	MOS 256/512
KEYBOARD Type Program function keys Numeric keygroup Detachable	Typewriter 13 std. Std. No	Typewriter 13 std. Std. No	Typewriter 5 std. Std. Std.	Teletype/keypunch 8 std. Std. Opt.	Several available No No Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L, R, U, D, H, Rt Std. Std. Std. No No No No No Std. Std. Std. Both std. No Opt. Data validation, math functions, field erase all std.	L, R, U, D, H, Rt Std. Std. Std. No No No No Std. Std. Std. Field std. No Std. Data validation, math functions, field erase all std.	L, R, U, D, Rt Std. Std. Std. Std. No No Std. Std. Std. Std. No Std. None	L, R, U, D, H, Rt Std. Std. Std. Opt. Opt. Std. Std., up only No Opt. Std. Std. No Opt. Protected format std.	None No No No No No No No No No No No No No No None
AUXILIARY Cassette recorder Printer Light pen Other devices	Dual drive Impact None Card reader	None Impact None Disk drives	Dual drive Impact None Card reader	Yes Yes None Diskette drive	None None None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Synchronous ASCII/EBCDIC 2000/2400 Block Std. No No	Half duplex Synchronous-BSC EBCDIC 4800 Block Std. Opt. No	Half, duplex Synchronous-BSC EBCDIC 4800 Block Std. No No	Half, full duplex Asyr./syn. opt ASC I 110 to 1200 Char./block opt. Std. Opt. Opt.	Half duplex Asynchronous Correspondence 134.5 Character Std. Std. Std.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	320 300 (3 yr.) 12,800 — — — December 1971 — Sanders	105 95 (3 yr.) 3,075 775 735 (3 yr.) 31,000 August 1972 — Sanders	80 to 120 — 3200 to 4,800 360 — — 14,400 February 1974 — Sanders	115 85 1,995 — — — February 1973 800 IOMEC	— — — — — — 1,780-2,199 April 1973 Over 100 I. P. Sharp
COMMENTS	Emulates IBM 2780 - Also see Report 70D-734- 01.	Price of con- troller includes one display unit. Emulates IBM 2770. Also see Report 70D-734- 01.	Price of con- troller includes two display units. Also see Report 70D-734-01.		Portable con- troller with key- board uses con- ventional TV set or video monitor; replaces the IBM 2741.

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SUPPLIER AND MODEL	I.P. Sharp IPSA 200	I.P. Sharp IPSA 300	Sycor 340	Sycor 255	Sycor 257
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No No No No No	Cluster 8/16 No No Yes Yes No	Stand-alone — Yes Yes Yes No No	Stand-alone — Yes No No No Yes	Cluster 32 Yes No No No Yes
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1024/1280 16 x 64/80 14 (diagonal) 89 5 x 7 dot matrix	1920 24 x 80 9 to 15 (diagonal) 96 ASCII/89 APL 5 x 7 dot matrix	576 9 x 64 7.75 x 5.5 62 5 x 7 dot matrix	480/1920 12 x 40; 24 x 80 6.5 x 9.5 64; 96 opt. 7 x 9 dot matrix	480/1920 12 x 40; 24 x 80 6.5 x 9.5 64; 96 opt. 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1024/1280	MOS 1920	MOS 576	MOS 4K to 8K	MOS 4K to 8K
KEYBOARD Type Program function keys Numeric keygroup Detachable	Several available No No Std.	Teletype/data entry No Std. Std.	Typewriter None Std. No	Typewriter/ keypunch 12 opt. Opt. Std.	Typewriter/ keypunch 12 opt. Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,H,D,Rt opt. Opt. Opt. Opt. Opt. Opt. Std., up only No No Opt. Opt. Variable intensity Opt. None	L,R,U,D,Rt Std. Std. Std. Std. Std. Std., up only Opt. Opt. Std. Opt. 2 opt. Std. None	L,R,U,D,H,Rt Opt. Opt. Std. Std. No No Std. Opt., up only Std. Std. No Char. only No Std. None	L,U,D,H,Rt, tab L/R, NL Std. Std. Std. Std. No No No Std. Std. Field std. 3 std. Std. Erase to end of field or unpro- tected field std.	L,U,D,H,Rt, tab L/R, NL Std. Std. Std. Std. No No No Std. Std. Field std. 3 std. Std. Erase to end of field or unpro- tected field std.
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None None None None	None None None None	Single/dual drive Impact None Card reader; 7/9-track tape; disk	None Impact Opt. Operator I.D. card reader	None Impact Opt. Operator I.D. card reader
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous Correspondence 134.5 Character Std. Std. No	Half duplex Asynchronous ASCII/APL 300 to 2400 Character Std. No No	Half duplex Asyn./syn. ASCII/EBCDIC 75 to 4800 Char./block Opt. Opt. No	Half duplex Synchronous - BSC ASCII/EBCDIC 1200 to 4800 Block Std. No No	Half duplex Synchronous - BSC ASCII/EBCDIC 1200 to 4800 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 2,515 to 2,725 — — — March 1974 — I.P. Sharp	— — 495 to 1,275 — — 1,310 to 1,876 July 1974 — I.P. Sharp	150 to 593 123 to 536 6,600 to 23,720 — — — February 1971 15,000 (incl. Oliv.) Sycor & Sorbus	138 133 4,840 — — — October 1973 150 (250 series) Sycor & Sorbus	120 115 4,220 120 115 3,790 October 1973 150 (250 series) Sycor & Sorbus
COMMENTS	Designed as a replacement for the IBM 2741.	Includes 2 control- lers and 4 key- board/display units; rack mounted.	Also see Report 70D-792-01.	Also see Report 70D-792-02.	Also see Report 70D-792-02.

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SUPPLIER AND MODEL	SYS Models 420, 820, & 1320	TEC, Inc. Models 410, 415, & 416	TEC, Inc. Models 420, 425, & 426	TEC, Inc. Models 430, 435, & 436	TEC, Inc. Models 440 & 1440
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Either 16 Yes, by vendor No Yes No No	Stand-alone — No Yes No No No	Stand-alone — No Yes No No No	Stand alone — No Yes Yes No No	Standalone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	Up to 4000 1-30 x 40/80/132 14 (diagonal) 128 5 x 7/7 x 9/ 9 x 13	1000/1920/960 20/50; 24 x 80/40 6 x 9 68 5 x 7 dot matrix	1000/960/1920 20 x 50; 24 x 40/80 6 x 9 68 5 x 7 dot matrix	1000/960/1920 20 x 50; 24 x 40/80 6 x 9 68 5 x 7 dot matrix	1728/1920 24 x 72/80 6 x 9 64 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 2K to 32K	MOS 1024/2048	MOS 1024/2480	MOS 1024/2048	MOS 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype 16 std. Std. Std.	ASCII None Opt. Yes	ASCII None Opt. Yes	ASCII None Opt. Yes	ASCII None Opt. Yes
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Std., up only Opt. Opt. Std. Opt. 2 opt. Opt. Word wraparound	L,R,U,D,H,Rt Std. Std. Selectable Std. Std. Std. No No Std. Std. Std. No Std. None	L,R,U,D,H,Rt Std. Std. Selectable Std. Std. Std. No No Std. Std. Std. No Std. Pollable	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. No No No Std. Std. No Std. None	L,R,U,D,H,Rt No No Std. No No Std. No No No Std. No No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Interface only Interface only No Punched tape reader/punch	None Interface None None	None Interface None None	Opt. Opt. No No	Opt. No No No
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	— Parallel interface ASCII Up to 400,000 Char./block — — —	Half/full duplex Asynchronous ASCII 110 to 9600 Block Std. No No	Half/full duplex Asynchronous ASCII 110 to 2400 Character Std. No No	Half/full duplex Asynchronous ASCII 110 to 9600 Character Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — — — — 5,000 to 48,000 January 1971 Over 1,000 SYS	— — 2,350 — — — February 1970 — TEC	— — 2,620 — — — February 1970 — TEC	— — 2,350 — — — February 1970 — TEC	— — 1,763 — — — January 1972 — TEC
COMMENTS	For purchase only; microproc- essor construction; several display arrangements; SYS sells OEM only.	Requires appropriate interface.			

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SUPPLIER AND MODEL	TEC, Inc. Models 450, 455, & 456	TEC, Inc. Models 460, 465, & 466	TEC, Inc. Model 1400	Tektronix Models 4012 & 4013	Tektronix Models 4014 & 4015
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Stand-alone — No Yes No No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No	Stand-alone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1000/960/1920 20 x 50; 24 x 40/80 6 x 9 68 5 x 7 dot matrix	1000/960/1920 20 x 50; 24 x 40/ 80 6 x 9 68 5 x 7 dot matrix	960 12 x 80 6 x 9 63 5 x 7 dot matrix	2590 35 x 74 6 x 8 94; 182 opt. 7 x 9 dot matrix	2590/3078/7018/ 8512 See Comments 11 x 15 94; 182 opt. 7 x 9 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1024/2048	MOS 1024/2048	MOS 1404	Storage tube 2590	Storage tube 2590/3078/7018/ 8512
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Opt. Yes	ASCII None Std. Std.	ASCII None Opt. Std.	Teletype None None No	Teletype None None No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. No No Std. Std. Std. No Std. Std. No Std. None	L,R,U,D,H,Rt Std. Std. Selectable Std. Std. Std. No No Std. Std. Std. No Std. Std. Std. Pollable, Burroughs compatibility	L,R,U,D,H,Rt Std. Std. Std. No No No Std. Std. Std. Std. Std. Std. Char. and field protection	Omnidirectional No Std. Std. No No No No No No Std. No Opt. Std. Vector, point, and incremental point modes	Omnidirectional No Std. Std. No No No No No No Std. No Opt. Std. Vector, point, and incremental point modes
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Interface None None	None Interface None None	None Yes None None	None Non-impact None Interfaces for several devices	None Non-impact None Joystick; punched tape reader/punch; scan converter
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Yes No No	Half duplex Asyn./syn. ASCII 110 to 9600 Block Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Half duplex Asynchronous ASCII/Correspond- ence 110 to 9600 Character Std. No No	Half/full duplex Asyn./syn. ASCII/Correspond- ence 110 to 9600 Character Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease \$/mo. Controller, 2-yr. lease \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Served by	— — 2,390 — — — June 1973	— — 2,900 — — — December 1973	— — 1,300 — — — February 1974	250 to 300 — 4,950 to 6,250 — — — Nov. 1972/ Jan. 1973	390 to 500 — 8,450 to 9,950 — — — March 1974
COMMENTS				Graphic/alpha- numeric data; upper/lower case alphabets; APL symbols (40B) graphic software.	APL character set; display formats: 35 x 74; 38 x 81; 58 x 121; 64 x 133.

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SUPPLIER AND MODEL	Tektronix Model 4023	Teletype Model 40	Terminal Communications TC 275	Terminal Communications TC 277	Texas Scientific Entelekon 10
ARRANGEMENT Stand-alone or clutter Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — No Yes Yes No No	Stand-alone — No No Yes No No	Stand-alone — No No No No Yes	Cluster: 32 No Yes No No Yes	Standalone — No No Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1920 24 x 80 5.5 x 9 94 5 x 7 dot matrix	1920 24 x 80 5.25 x 11.25 127 7 x 9 dot matrix	480/1920 12 x 40; 24 x 80 14 (diagonal) 64 7 x 9 dot matrix	480/1920 12 x 40 24 x 80 14 (diagonal) 64 7 x 9 dot matrix	1920 24 x 80 6 x 9 66 5 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1920	MOS 1920; 3480/ 5760 opt.	MOS 480/1920	MOS 480/1920	MOS 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Selectric Std. Std. Std.	Typewriter-ASCII None None No	Typewriter/data entry Opt. Std. Std.	Typewriter/data entry Opt. Std. Std.	ASCII None None Opt.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. Std. Std. Std., up only No Std. Std. Std. Std. Std. Std. Std. None	L,R,U,D,H,Rt Opt. No Std. Std. Std. No Opt. No Std. Std. Both std. 2 std. Std. Scrolling, reverse video	L,R,U,D Std. Std. No Std. Std. Std. No No Std. No No 2 std. Opt. Negative image of char. at cursor can be displayed	L,R,U,D Std. Std. No Std. Std. Std. No No Std. No No 2 std. Opt. Reverse video opt.	L,R,U,D,H,Rt Opt. Std. Opt. Opt. Opt. Std. No Std. Std. Std. Both std. No No None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Yes None None	Single drive Impact None None	None Impact Opt Operator ID card reader	None Impact Opt. Operator ID Card reader	None Impact/non-impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asynchronous ASCII 110 to 9600 Char./block Std. No No	Half duplex Asynchronous ASCII 1200/1050 Block Std. No No	Half duplex Synchronous-BSC ASCII/EBCDIC 1200 to 7200 Block Std. No No	Half duplex Synchronous-BSC ASCII/EBCDIC 1200 to 7200 Block Std. No No	Half duplex Asynchronous ASCII 110 to 9600 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	98 to 133 — 2,995 to 3,890 — — — July 1973 — Tektronix	— — 2,995 to 5,610 — — — 1973 — Teletype	125 120 4,625 — — — January 1974 100 TCI	83 79 3,650 183 183 7,340 Second qtr. 1974 — TCI	— — — — — — 1970 100 Sorbus
COMMENTS		For purchase only; also available from AT&T, RCA Service, & WU Data Services; also see Report 70D-830-04			Contact Texas Scientific for pricing

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SUPPLIER AND MODEL	Texas Scientific Entelekon 80	Texas Scientific Entelekon 200	Trivex Model 40/80	UNIVAC Uniscope 100
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Cluster 64 No Yes No Yes No	Cluster 32 No Yes No No Yes	Either 32 No Yes No Yes No	Either 31 No Yes No No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	480/960/1920 12 x 40/80; 24 x 80 8 x 11 64 5 x 7 dot matrix	1920 24 x 80 6 x 9 94 5 x 7 dot matrix	240/480/960 6/12 x 40; 12 x 80 6 x 9 64 5 x 7 dot matrix	960/1024 12 x 80; 16 x 64 5 x 10 64; 96 opt. Stroke
REFRESH MEMORY Type Capacity, characters	MOS 480/960/1920	MOS 1920	MOS 1024	MOS/Core 1024
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII 6 std. Opt. Opt.	Typewriter/data entry 26 std. Opt. Opt.	ASCII None Std. Std.	ASCII 4 opt. Opt. No
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Opt. Std. Opt. Opt. Opt. Std. No Std. Std. Std. Both std. No No None	L,R,U,D,H,Rt Std. Std. Opt. Std. No No No Std. Std. Std. No 2 std. Opt. Field erase std.	L,R,U,D,H Std. Std. Opt. Std. Std. Std. No Std. Std. Std. No No No None	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Both std. No Std. None
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact/non-impact None None	None Impact/non-impact Opt. Operator I.D. card reader	None Impact None None	Dual drive Impact/non-impact None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 1200 to 9600 Block Std. No No	See Comments — — — — — —	Half duplex Asyn./syn. ASCII Up to 9600 Block Std. Opt. No	Half duplex Asyn./syn. ASCII Up to 9600 Block Std. No No
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— 50 to 280 (3-yr.) 3,995 to 6,000 — — 1,995 February 1970 500 Sorbus	— 106 to 166 (3 yr.) 4,000 to 6,275 — — — March 1974 — Sorbus	— 1,005 to 1,280 — — 8,330 to 10,710 April 1971 2,000 Raytheon	129 to 140 — 4,326 to 4,563 56 to 76 — 2,016 to 2,688 May 1970 — UNIVAC
COMMENTS	Pricing includes control unit.	Attaches to IBM 3270 control unit.	Also see Report 70D-860-01.	Also see Report 70D-877-05.

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SUPPLIER AND MODEL	Wang Laboratories System 2200B-1	Westinghouse Model 1600	Westinghouse Model 1600 CE	Westinghouse Model 1620
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Stand-alone — Yes Yes Yes No No	Stand-alone — No Yes Yes No No	Either 24 No Yes No No No	Stand-alone — No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	1024 16 x 64 8 x 10.5 64 5 x 7 dot matrix	1600 20 x 80 6 x 8 64; 96 opt. 5 x 7 dot matrix	1600 20 x 80 6 x 8 64 5 x 7 dot matrix	1920 24 x 80 7 x 9 64; 96 opt. 5/9 x 7 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 1024	MOS 1600	MOS 1600	MOS 1920
KEYBOARD Type Program function keys Numeric keygroup Detachable	Teletype 16 std. Std. Std.	ASCII None Std. Opt.	ASCII 9 std. None Std.	ASCII None Std. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Std. Std. No Opt. Std. Std. Std. Std. Std. Std. No No No Opt. —	L,R,U,D,H,Rt Std. Std. Std. Std. Std. Std. Up only Std. Std. Std. Std. No No No Std. Polling; auto retransmission	L,R,U,D,H,Rt. Std. Std. Std. Std. Std. Std., up only Std. Std. Std. Std. Std. Std. Data validation	R,Rt No No No No No Std., up only No No Std. No No Std. —
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	Single/dual drive Impact/non-impact None Diskette and disk drives, card reader, plotters, punched tape	None Interface None None	None None None None	Interface only Interface only None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half duplex Asynchronous ASCII 110 to 1200 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 110 to 9600 Char./block Std. No	Half/full duplex Asynchronous ASCII 110 to 9600 Character Std. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	160 144 3,200 270 to 2,500 243 to 2,250 5,400 to 50,000 December 1973 Over 25 Wang Laboratories	— — 2,995 to 3,325 — — — December 1971 Westinghouse	— — 2,995 — — 5,000 September 1974 — Westinghouse	— — 1,400 — — — September 1974 — Westinghouse
COMMENTS	Over 28 peripherals available; switch- selectable speeds; pricing includes single cassette unit	Teletype interface (20 or 60 ma.) available; also serviced by Honey- well; switch-select- able speeds		

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SUPPLIER AND MODEL	Witek Model 500	Wyle Series 8000	Wyle Series 9000	Xerox Models BC 100 & BC 200
ARRANGEMENT Stand-alone or cluster Maximum displays/controller Programmable Local operation Teletype 33/35 compatible IBM 2260/2265 compatible IBM 3270 compatible	Either 4 No No Yes Yes Yes	Either 16 No Yes No Yes No	Either 32 Yes Yes No Yes Yes	Either 4 No Yes Yes No No
DISPLAY ORGANIZATION Display positions, chars/display Display format; lines x chars/line Display area; h x w, inches Displayable symbols Symbol formation	2000 27 x 74 12 (diagonal) 98 5 x 7 dot matrix	480/960/1920 12 x 40/80; 24 x 80 7 x 10 64 5 x 7 dot matrix	480/960/1920 12 x 40/80; 24 x 80 7 x 10 64 5 x 7 dot matrix	960/1600 24 x 40; 20 x 80 12 to 17 (diagonal) 155 5 x 8 dot matrix
REFRESH MEMORY Type Capacity, characters	MOS 2048	MOS 1024/2048	MOS 1024/2048	— —
KEYBOARD Type Program function keys Numeric keygroup Detachable	ASCII None Std. No	ASCII; data entry None Opt. Opt.	Typewriter 16 std. Std. Opt.	ASCII Std. Opt. Std.
FEATURES Cursor control; Left, Right, Up, Down, Home, Return Tabulation Addressable cursor Cursor blinking Character insert and delete Line insert and delete Line erase Roll Split screen Partial screen transmit Character repeat Char. or field blinking Programmable brightness levels Audible alarm Other capabilities	L,R,U,D,H,Rt Yes Yes No Yes Yes Yes Up only Yes Yes Yes No 2 Yes None	L,R,U,D,H Std. No Std. Std. Opt. Std. Std. No No Std. Opt. Std., char. only No No None	L,R,U,D,H Std. Std. Std. Std. Std. Std. Opt. Std. Std. Std. No 2 std. No None	L,R,U,D,H Std. Std. Std. Std. Std. Std. No No Std. Std. Std. Opt. 8-color display; point plotting
AUXILIARY DEVICES Cassette recorder Printer Light pen Other devices	None Impact None Magnetic card reader	None Impact None None	None Impact None None	None Opt. None None
TRANSMISSION Mode Technique Code Speed, bits/second Block or character EIA RS-232C interface Integral modem Telephone coupler	Half/full duplex Asyn./syn. - BSC ASCII 1200 to 2400 Char./block Std. Std. No	Full duplex Asyn./syn. ASCII/EBCDIC 1200 to 9600 Char./block Std. Opt. No	Half/full duplex Asyn./syn. ASCII/EBCDIC 1200 to 9600 Char./block Std. No No	Half/full duplex Asyn./syn. ASCII 300 to 9600 Char./block Std. Opt. Opt.
PRICING AND AVAILABILITY Display unit, 1-yr. lease, \$/mo. Display unit, 2-yr. lease, \$/mo. Display unit, purchase price, \$ Controller, 1-yr. lease, \$/mo. Controller, 2-yr. lease, \$/mo. Controller, purchase price, \$ Date of first production delivery Number of displays installed to date Serviced by	— — 12,100 — — — January 1972 80 Syntonic	— — 2,500 — — 8,500 1972 — Sorbus	Not available Not available Not available Not available Not available Not available August 1974 — Sorbus	35 to 225 28 to 115 (4 yr.) 750 to 3,500 195 to 235 163 to 196 (4 yr.) 6,000 to 7,265 1970/1971 Over 300 Xerox
COMMENTS	Includes two 50,000-char. magnetic tape buffers. Also see Report 70D-918-01.			Model BC 100 has smaller screen capacity. Leased units are available only with Xerox computers.