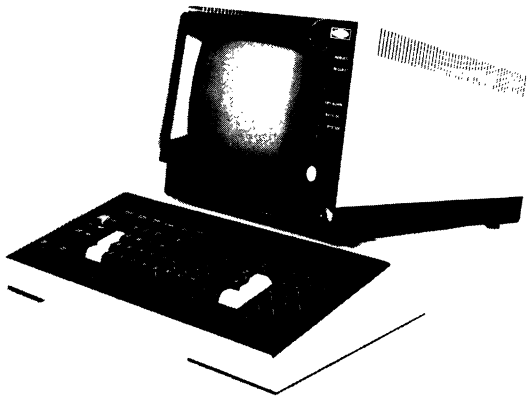
Raytheon PTS/1200 Distributed Processing System



The Raytheon PTS/1200 Distributed Processing System provides support for up to 32 display stations and/or printers. Both 9-inch (shown here) and 15-inch displays can be used with the system.

A family of distributed data processing systems ranging from a diskless system for RJE applications to a full-function DDP system.

The PTS/1200 Series is based on a 16-bit processor with either 64K or 128K of RAM. A wide variety of configurations are available within the four model groups of the series; up to 32 display stations or printers may be supported, depending on the configuration selected. A variety of disk or diskette storage capacities are available on all models except the diskless PTS/1210, up to a 320MB maximum on the top-of-the-line PTS/1260.

In addition to the PTS/1200 Operating System, Raytheon provides its Macrol display-oriented programming language. Application packages include RayKey/2, /3, and /4, RayWord, and RayCode. A variety of software products are available for both interactive and batch communications, including IBM 3270 and dual 3270 upline (BSC), 3274 (SNA/SDLC), 2780/3780, 360/20 HASP (BSC), 3776 (SNA/SDLC), and ASCII teletype.

A high-end PTS/1260 system consisting of 64K of RAM, 80MB of disk storage, eight displays, one printer, and dual 3270 upline communications is priced at $51,000.

MANAGEMENT SUMMARY

Raytheon introduced the PTS/1200 Series in 1975; the initial models in the series were the PTS/1200 Mark I and Mark II. These first models were replaced by a second generation of systems in 1981. Current members of the family include the PTS/1210, PTS/1220, PTS/1240, and PTS/1260.

The PTS/1200 Series consists of a family of distributed data processing systems ranging from the diskless PTS/1210, designed for remote job entry applications, to the fully functional PTS/1260, with up to 320MB of disk storage. Each member of the family is based on a 16-bit processor with 64K or 128K of RAM, and is equipped with the PTS/1200 Operating System. Raytheon also provides its Macrol display-oriented programming language for use with the PTS/1200 Series. Each PTS/1200 system is available in a variety of configurations, consisting of displays, printers, disk or diskette storage, and communications utilities.

A wide range of communications software products are available. For interactive or batch communications, the PTS/1200 can operate under both IBM BSC and SNA/SDLC protocols. For BSC interactive communications, IBM 3270 and dual 3270 upline packages are provided. SNA/SDLC interactive communications are provided via an IBM 3274 SNA/SDLC package. For batch communications, BSC capabilities are provided via IBM 2780, 2780 multidrop, 3780, and 360/20 HASP packages, while SNA/SDLC communications are provided via the IBM 3776 product. Other program products provide ASCII teletype, PARS/IPARS, and SITA P.1024C (Uniscope 100) emulation. Raytheon also provides the following application packages: RayKey/2, RayKey/3 and RayKey/4, for data entry application; RayWord, for text editing applications; and RayCode, for distributed editing applications.

CHARACTERISTICS

VENDOR: Raytheon Data Systems Company, Division of Raytheon Company, 1415 Boston-Providence Turnpike, Norwood, MA 02062. Telephone (617) 762-6700.

DATE OF ANNOUNCEMENT: September 1975.

DATE OF FIRST DELIVERY: Information not available.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Raytheon Data Systems Company.

CONFIGURATION

The PTS/1200 Series consists of four models: PTS/1210, PTS/1220, PTS/1240, and PTS/1260. All models are based on an RDS-proprietary 16-bit processor, featuring from 64K to 128K bytes of RAM.

The PTS/1210 is the entry-level model of the PTS/1200 Series; the PTS/1210 contains no disk storage capacity and is designed for basic RJE applications. Support is provided

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COMPETITIVE POSITION

The PTS/1200 is a mature product line with a large installed base. Direct competition comes mainly from other established DDP systems such as the Four Phase Series IV and the Harris 1600 family.

ADVANTAGES AND RESTRICTIONS

The PTS/1200 Series provides a wide variety of configurations, including substantial software support. However, as was mentioned previously, it is a mature product line with no new enhancements anticipated in the future (much the same as the company's PTS-100 system, from which the PTS/1200 is an upgrade).

Datapro received an insufficient number of responses on the Raytheon PTS/1200 in the 1982 Terminal Users' Survey to provide a valid sample; therefore, no User Reaction is included in this report.□

for up to four 800/1600 bpi magnetic tape drives, and a 300-cpm card reader. Two communications program products are supported: IBM 3270 and 360/20 HASP, utilizing BSC protocol only. These program products can operate separately or concurrently in one of three modes: dual 3270 upline, 3270 and 360/20 HASP, or dual 3270 upline and 360/20 HASP. Support is provided for user-written application programs which do not require disk access. A variety of configurations are available providing either 64K or 128K of RAM, from 8 to 24 displays, and from 2 to 20 printers (up to a maximum of 32 devices, displays and/or printers).

The PTS/1220 provides diskette storage capacity via double-sided, double-density diskette drives. The PTS/1220 processor subsystem houses two 1MB (formatted) drives; an additional chassis may be added to house a third and fourth drive of 1MB each. Up to four 800/1600 bpi magnetic tape drives, and a 300-cpm card reader, are also supported. The communications facilities are the same as those available on the PTS/1210. A variety of configurations are available for the PTS/1220, providing either 64K or 128K of RAM, from 8 to 16 displays, and from 2 to 6 printers (up to a maximum of 22 devices, displays and/or printers).

The PTS/1240 is a more sophisticated distributed processing system, designed for applications requiring intermediate disk storage capacity. The PTS/1240 provides support for up to four 10MB fixed or removable disk drives; also supported are a 1MB diskette drive, up to four 800/1600 bpi magnetic tape drives, and a 300-cpm card reader. A wide variety of software products are available for use with the PTS/1240. These include: the PTS/1240 Operating System; Raytheon's display-oriented Macrol programming language; IBM 3270 and dual 3270 upline interactive communications utilities; IBM 2780, 2780 multidrop, 3780, and 360/20 HASP batch communications utilities; IBM 3274 SNA/SDLC communications capability; and Raytheon's RayKey/2, RayKey/3, RayKey/4, RayWord, and RayKey applications packages. A variety of configurations are available providing either 64K or 128K bytes of RAM, from 8 to 24 displays and from 2 to 20 printers (up to a maximum of 32 devices), and varying storage capacities and communications capabilities.

The PTS/1260 is the top-of-the-line member of the PTS/1200 Series. The basic PTS/1260 system comes with an 80MB disk storage drive; total disk storage capacity can be expanded to 320MB with the addition of up to three 80MB storage modules. The PTS/1260 also supports up to four 800/1600 bpi magnetic tape drives and a 300-cpm card reader. All software products supported on the PTS/1240 are supported on the PTS/1260. As with the other members of the PTS/1200 Series, a variety of PTS/1260 configurations are available, featuring either 64K or 128K of RAM, 16 to 24 displays and 2 to 20 printers (up to a maximum of 32 devices), and varying storage capacities and communications utilities.

TRANSMISSION SPECIFICATIONS

Half-duplex synchronous communication is supported at speeds from 2400 to 19,200 bits per second. The EBCDIC code is used, and both BSC and SNA/SDLC protocols are supported on the PTS/1220, PTS/1240, and PTS/1260; the PTS/1210 supports only BSC communications. The PTS/1200 Series members are transmission-compatible with the IBM 2780, 3780, and 360/20 HASP terminals when operating in batch mode, and with the IBM 3270 when operating in the interactive mode. Transmission is point-to-point over switched or dedicated communications lines, or multipoint over a dedicated facility. An EIA RS-232-C interface is provided for connection to an external modem.

SOFTWARE

All PTS/1200 models include the PTS/1200 Operating System, which provides for system loading and operation control. Multiprogramming and multi-tasking support is provided for batch and interactive applications. For custom applications, Raytheon provides the Macrol programming language, a display-oriented language which provides the basis for applications ranging from simple to complex large data entry/retrieval applications.

A variety of communications utilities are available for the PTS/1200. For interactive communications, the following are provided: IBM 3270, Dual 3270 Upline, and Dual 3270 Control Unit Addressing (all BSC); and IBM 3274 (SNA/SDLC). For batch communications, the following are provided: IBM 2780, 2780 Multidrop, 3780, and 360/20 HASP (all BSC); and IBM 3776 (SNA/SDLC). For asynchronous communications, ASCII Teletype is supported. Other industry-specific protocols supported include PARS/IPARS and SITA P.1024C (Uniscope 100).

The interactive BSC protocols use leased four-wire multipoint half-duplex telephone networks. IBM 3270 emulation provides the PTS/1200 with the interactive communications capability of an IBM 3270 terminal; Dual 3270 Upline provides two 3270 uplines with separate control unit addresses in one processor; Dual 3270 Control Unit Addressing supports two control unit addresses on one line. IBM 3274 SNA/SDLC interactive communications allows communications with an IBM or IBM-compatible host as part of a remotely attached system using leased four-wire multipoint full-duplex networks.

In batch mode, the PTS/1200 is functionally compatible with the IBM 2780, 3780, and 360/20 HASP protocols. The 2780 multipoint protocol offers a host polling environment in place of the usual 2780 bidding environment. HASP protocols enable the user to communicate with the host as an IBM 360/20 RJE workstation, supporting multileaving with up to two input streams, five output streams, and an operator console stream. The IBM 3776 SNA Remote Job Entry protocol offers up to six logical sessions with an IBM or IBM-compatible host, with operation similar to that of a 3776 Model 3.

The PTS/1200 also provides networking support for the following: up to four 3270 BSC multidrop downlines; up to 20 ASCII Teletype downlines; and point-to-point between

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PTS/1200's using 2780 or 3780. Concurrrent communications are allowed for the following network configurations: 3270 BSC plus 3780, 3780, or 360/20 HASP; 3270 BSC and/or TTY with any BSC upline; 3274 SNA Plus 2780, 3780, or 360/20 HASP; and 3776 SNA plus 3270 BSC.

Raytheon provides the following application packages for use with the PTS/1200: RayKey/2, RayKey/3, RayKey/4, RayWord, and RayCode. RayKey/2, /3, and /4 are Raytheon's data entry packages. RayCode is a distributed editing package, and RayWord is Raytheon's text processing package.

COMPONENTS

PROCESSOR: All PTS/1200 models are based on a 16-bit processor containing either 64K or 128K of RAM. All models attach up to four magnetic tape units and one card reader. A varying number of display stations, printers, disks, diskettes, and protocols are supported, depending on the model and configuration selected.

DISPLAY STATIONS: Available in both 9- and 15-inch (diagonal) screen sizes. The following display formats are available:

Master/slave				
Total char.	960	1024		
Lines/display	16	12		
Char./line	64	80		
Master only				
Total char.	960	1024	1920	1920
Lines/display	16	12	24	30
Char./line	64	80	80	64

Characters are formed utilizing a 7-by-7 (64 characters per line) or 7-by-9 (80 characters per line) dot matrix. Typewriter or data entry style keyboards may be selected, both of which are detachable. LED system status indicators are included.

DISK /DISKETTE STORAGE: The PTS/1210 provides no disk storage. The PTS/1220 provides diskette storage capacity via double-sided, double-density diskette drives. Two 1MB formatted diskette drives are standard; a third and fourth 1MB drive may be added, bringing total diskette storage capacity to 4MB.

The PTS/1240 can accommodate up to four 10MB fixed or removable disk drives. One 10MB drive is included with the basic system. The PTS/1260 is equipped with an 80MB disk storage drive as standard; total disk storage capacity can be expanded to 320MB with the addition of three additional 80MB storage modules.

MAGNETIC TAPE STORAGE: Each member of the PTS/1200 Series, including the PTS/1210, can be configured with up to four 800/1600 bpi magnetic tape drives.

SERIAL PRINTERS: Three models of serial matrix printers are available for use with the PTS/1200 Series. Tabletop serial printers are available at rated print speeds of 100 and 120 cps, printing up to 132 columns bidirectionally. Also available is a letter quality printer with a rated print speed of 55 cps and switch-selectable line lengths of 132 and 158 columns.

LINE PRINTERS: Three models of line printers are available, with print speeds of 300, 600, and 900 lpm. All models print 132 characters per line, with horizontal spacing of 10 cpi and vertical spacing of 6 or 8 lpi.

CARD READER: All models of the PTS/1200 Series can be configured with one card reader. The card reader reads 80-column cards at a rated speed of 300 cpm.

PRICING

The Raytheon PTS/1200 Series is available for purchase, or on a lease basis. A large variety of configurations are available for all models of the series. Raytheon declined to provide detailed pricing for the PTS/1200, but did provide the following sample configuration price.

A PTS/1260 system, consisting of 64K bytes of RAM, an 80MB disk drive, eight display stations, one 120-cps serial printer, and dual 3270 upline BSC interactive communications, carries a purchase price of $51,000.■

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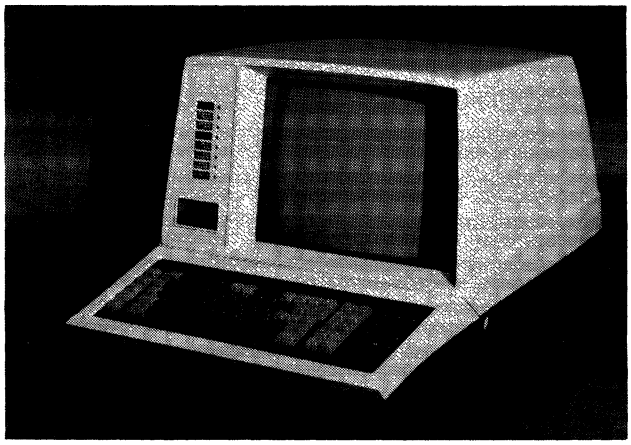
Programmable Terminal System



A PTS 100 system can include from 1 to 32 CRT display units, as well as a variety of auxiliary I/O devices. Display screen capacities of 480, 960, and 1920 characters are available.

A user-programmable, minicomputer-based, family of display/keyboard terminals offered in both stand-alone and clustered system configurations.

The system is a direct replacement for the IBM 3270 and 2260 display terminal. Peripherals include printers, teletypewriters, card readers, disk drives and tape cassette recorder.

Software support for the terminals includes an operating system and utility programs, as well as IBM emulation.

Transmission can be synchronous or asynchronous in half- or full-duplex mode at speeds up to 9600 bps using ASCII or EBCDIC.

A two display, IBM 3270 emulation system rents for $284 per month, including maintenance.

A larger system with 32 displays, emulating the IBM 3270 rents for $2,300 per month, including maintenance.

MANAGEMENT SUMMARY

The Raytheon PTS 100 is a minicomputer-based, stand-alone or clustered display terminal that supports remote processing under the direction of user-created application programs. Raytheon offers the PTS 100 as a replacement for IBM's 3270 Information Display System (BSC version) and 2260 Display Station in both local and remote environments. Raytheon-provided software emulators support all functions of the PTS 100 terminals and provide compatibility with IBM communications software. A leading supplier of reservation and departure control systems to major airlines, Raytheon also offers the PTS 100 as an add-on or replacement terminal (also via software emulation) for IBM's 2948/2915 display terminals used in its PARS/IPARS airline reservation system.

The PTS 100 is available in a stand-alone version with 1 or 2 display units and in clustered versions that accommodate up to 32 display units. Screen capacities include 480-, 960-, and 1920-character displays; by comparison, IBM offers only the 480- and 1920-character screen sizes for its 3270, and sizes up to 960 characters for its 2260. Users can specify either of two display arrangements for the 960- and 1920-character screen capacities when ordering the PTS 100.

A host of available peripherals—including line and serial printers, card readers, and disk (cartridge) storage—strengthen the PTS 100 as a terminal and provide the necessary support for remote file processing. Disk storage capacity is impressive; up to 8 drives provide storage for 2.5 to 20.5 million bytes of data. The terminal's peripheral-handling capability is determined by the number of multiplexer subchannels included. The basic terminal provides 7, while an expanded terminal provides as many as 23. Each subchannel can operate in either simplex or half-duplex mode and can handle one data stream at a time. Communications and low-speed I/O devices interface the multiplexer subchannels; disk storage attaches directly to the mini-computer's ➢

CHARACTERISTICS

VENDOR: Raytheon Data Systems Company, Division of Raytheon Company, 1415 Boston-Providence Turnpike, Norwood, Massachusetts 02062. Telephone (617) 762-6700.

DATE OF ANNOUNCEMENT: May 1971.

DATE OF FIRST DELIVERY: October 1972.

NUMBER DELIVERED TO DATE: 5000.

SERVICED BY: Raytheon Data Systems Company.

MODELS

Four models are available—two stand-alone and two clustered terminals.

- **Model 1005—a stand-alone terminal with separate processor, 16K bytes of memory, one or two keyboard/display units, and an optional printer.**
- **Model 1014—a stand-alone terminal with separate processor, 16K to 32K bytes of memory, one or two keyboard/display units, and support for optional I/O devices.**
- **Model 1015—a medium-scale clustered terminal system with 16K or 32K bytes of memory that can accommodate up to 8, 16, or 32 keyboard/display units and support several I/O devices.** ➢

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high-speed I/O bus, which can also interface a host computer via a channel interface.

The PTS 100 provides a high degree of flexibility with respect to data communications. Speeds range to 9600 bps. Codes supported via software translation include EBCDIC, ASCII, SBT, and BCD.

Raytheon provides strong software support for the PTS 100. Besides emulator programs for the IBM 3270, IBM 2260, and IBM PARS/IPARS, Raytheon provides two macro assemblers (to support user creation of applications programs), an operating system, and a library of utility programs. The assemblers permit the user to generate application programs for the PTS 100 on a Raytheon Model 704 or 500 minicomputer or on an IBM System/360 or 370 computer under OS or DOS. The utility programs provide strong assistance to the user in loading, debugging, and maintaining his application programs.

Raytheon introduced the PTS 100 in May 1971, and production deliveries began during the last quarter of 1972. Raytheon currently has about 5,000 systems (22,000 displays) installed, consisting mainly of PTS 100 systems plus some of the newer PTS 1200 systems.

Service is provided by Raytheon Data Systems, with 52 service locations nationwide.

USER REACTION

In April 1976, Datapro conducted telephone interviews with six users of the Raytheon PTS 100 system. These users reported on their experience with a total of 1,932 display units. Their ratings, which follow, indicate a high degree of satisfaction with all aspects of the PTS 100.

	Excellent	Good	Fair	Poor	WA*
Overall performance	5	1	0	0	3.8
Ease of operation	6	0	0	0	4.0
Display clarity	2	4	0	0	3.3
Keyboard feel & usability	5	1	0	0	3.8
Hardware reliability	3	3	0	0	3.5
Maintenance service	3	3	0	0	3.5
Software & technical support	3	2	0	0	3.6

*Weighted Average on a scale of 4.0 for Excellent.

The users unanimously cited price/performance, reliability, and IBM compatibility as the key advantages of the PTS 100. Just half of the users we contacted were taking advantage of the terminal's programmability. Strong vendor support scored another big plus for the PTS 100. According to the users, Raytheon has been very responsive to their needs, and on-site spare parts are available at most locations. Not one of the respondents could point to a single disadvantage—not even screen glare.

Three of the six respondents were large users with from 450 to 800 displays; the other three reported on system sizes of 12 to 30 displays. All but one of the six had been using the Raytheon terminals for over a year; the other, a new installation of 600 displays, had been in use for six months. All six were planning to add more of the Raytheon displays.

- Model 1020—A large-scale clustered terminal system with 16K to 64K bytes of memory that can accommodate up to 24 or 32 keyboard/display units and support several I/O devices.

CONFIGURATION

The basic PTS 100 system (all models) is built around a 16-bit minicomputer with 16K bytes of MOS semiconductor memory, expandable to 32K or 64K bytes in 16K-byte increments. In addition to its complement of CRT display units, the system can include a variety of peripheral devices, including printers, teletypewriters, card readers, and magnetic disk drives. A magnetic tape cassette recorder is included with each terminal for program loading.

The minicomputer features a bidirectional I/O bus with a maximum transfer rate of 1 million bytes/second. The I/O bus can support up to eight high-speed I/O devices including disk storage, magnetic tape units, host processor channel interfaces, and special user interfaces.

Low-speed I/O devices are attached via a multiplexer channel with a maximum transfer rate of 9600 bits/second. By means of an adapter, each of eight multiplexer subchannels can accommodate one peripheral device or communications interface operating in the half-duplex or simplex mode; full-duplex operation requires two subchannels. One multiplexer subchannel is dedicated to input from all keyboards associated with the attached display units, while a second is used for communications; therefore, six subchannels are available for external device usage. Model 1020 can accommodate 1 or 2 additional multiplexer channels to provide a total of 14 or 22 usable subchannels.

The PTS 100 System is designed for remote operation in a communications environment or for local operation as a computer peripheral subsystem for an IBM System/370 or System/360 via the computer's byte or block multiplexer or selector channel. The data transfer rate in this mode is 200,000 bytes/second.

The parameters of each of the models of the PTS 100 System are listed below:

Model	Memory Size, bytes	Multiplexer Subchannels	Maximum Display Units 1920 Char.	960 Char.	480 Char.
1005	16K	1	2	or 2	or 2
1014	16K or 32K	4	2	or 2	or 2
1015	16K or 32K	7	8	or 16	or 32
1020*	16K to 64K	6/14/22	24	or 32	or 32

*Can accommodate one or two additional multiplexer channels up to a maximum of 22 subchannels.

TRANSMISSION SPECIFICATIONS

Synchronous or asynchronous in the half- or full-duplex mode. Four modem adapters are each designed to accommodate specific transmission codes and code levels, including 6-level, 6-unit code; 8-level, 8-unit code; and 10-level, 8-unit code. Each adapter provides an EIA Standard RS-232C or CCITT V.24 modem interface and can operate at speeds up to 9600 bits/second. The adapter designed for 10-level, 8-unit code supplies its own clocking; however, clocking derived from an external modem must be applied to the other adapters.

DEVICE CONTROL

The nucleus of the PTS 100 is a display-oriented minicomputer that executes all terminal operations under program control. Keyboards are not connected to their corresponding display monitors; data keyed and data displayed is entirely controlled by the stored program. All peripheral devices are interrupt-driven, and, except for the displays, transfer data through the arithmetic-logic unit of the processor. Programs can be loaded from cassette tape,

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These high scores and complimentary remarks for the PTS 100 and its vendor make it clear that the PTS 100 is a cost-effective alternative to the IBM 3270 that merits serious consideration by other prospective users.□

punched cards, or cartridge disk. Programs can also be loaded remotely via the communications facility.

Communications compatibility is a function of the program loaded into main memory. Under Raytheon-supplied emulator programs, the PTS 100 can operate as a local or remote IBM 2260 Display Station, as a local or remote IBM 3270 Information Display System, or as an IBM PARS/IPARS airlines reservation terminal.

Off-line processing is also supported by the PTS 100, but processing cannot be performed concurrently with communications. User programs are written in a macro-level assembly language.

SOFTWARE: Raytheon provides a full complement of software packages for the PTS 100, including an operating system, two versions of an assembler, a library of utility programs, and four emulator programs.

The operating system for the PTS 100 is called the Input/Output Control System (IOCS) Monitor. The IOCS Monitor controls all I/O operations, error detection and handling, servicing user program requests for control operations on the I/O devices, and handling I/O activity to maintain maximum I/O speeds without burdening the user program. Four macro commands initiate all I/O operations.

Utility programs include: an absolute or relocatable loader, which loads either kind of program and links independently assembled program segments; a file update program, which features program or line insert, program correct, program or line delete, program or line replace, program output, and file directory creation; a debug program, which provides debugging aids for programmers; a system generator, which permits the user to generate a specialized IOCS Monitor from user-supplied parameters such as memory size, interrupt level assignments, logical and physical device assignments, and monitor modules required; a dump (list) program for peripheral devices; a memory dump program; and three disk utility programs, which permit the user to initialize a disk, to allocate new files and delete existing ones, and to dump (list) disk-allocated files.

Source programs can be assembled by means of cross-assemblers on a Raytheon Model 704 or 500 minicomputer or on an IBM System/360 or 370 computer under OS or DOS. Each assembler requires 16K bytes and provides the same assembly-language statements, which can define and use macro instructions. Macro definitions fall into two categories: those that relate the object program to facilities of the PTS 100 software, and those created for the current program and for inclusion in the macro library for future use.

Emulator programs include the 2260/2848 Local and Remote Emulators, the 3270 Local and Remote Emulators, and the PARS/IPARS Emulator. The emulator programs are compatible with existing IBM software for the corresponding IBM products; each runs under the IOCS Monitor. The 2260 and 3270 Remote Emulators operate at speeds up to 9600 bps in a point-to-point or multipoint arrangement. The 3270 emulator will not operate in the Transparent Text mode, although it can be used in a multipoint arrangement with IBM BSC terminals operating in the Transparency mode. The 3270 Emulator operates with either ASCII or EBCDIC transmission code. The PARS/IPARS Emulator transforms the PTS 100 into a replacement for the IBM 2946 or 2948 and is compatible with the IBM 1006 line control discipline.

KEYBOARD: Two typewriter-style keyboards (both ASCII), one without and one with a numeric keyset, are available with the 2260 Emulator. A 69-key data entry and a 69- or 81-key typewriter keyboard are available with the 3270 Emulator. EBCDIC-only keyboards are provided with the Local 3270 Emulator; while EBCDIC or ASCII keyboards are available with the Remote 3270 Emulator. The 69-key format includes 2 Program Attention keys, and the 81-key format adds 12 Program Function keys. A special keyboard is provided with the PARS/IPARS Emulator.

PRINTERS: Teletype Model 33 ASR or RO at 10 char/second (Report C27-830-101), GE TermiNet 300 at 30 char/second (Report C27-450-101), Centronics Model 101A at 165 char/second (Report C27-127-101), or Extel at 15 char/second. A Dataproducts Model 2230 line printer with 136 print columns and a rated speed of 300 lpm is also available.

COMPONENTS

CRT DISPLAY: Via a 15-inch (diagonal measurement) CRT. The standard display arrangements are as follows:

Characters/Display	480	960	960	1920	1920
Lines/Display:	12	15	12	24	30
Characters/Line:	40	64	80	80	64

A character set of 64 ASCII symbols, including upper-case alphabetics, numerics, and special characters, is displayed in green against a dark background. An optional 96-character set of displayable symbols includes lower-case alphabetics. Characters are generated by a 7-by-7 (64-character set) or 7-by-9 (96-character set) dot matrix.

CARD READER: Reads 80-column cards punched in Hollerith or binary code at a rated speed of 300 cards/minute. Input hopper and output stacker capacities are 600 cards each.

DISK STORAGE: Disk cartridge drive (Diablo) provides storage for 2,560,000 bytes via an IBM 2315-compatible disk cartridge. Up to 8 drives can be accommodated for a total capacity of 20,480,000 bytes. The average positioning time and average rotational delay are 70 and 20 milliseconds, respectively.

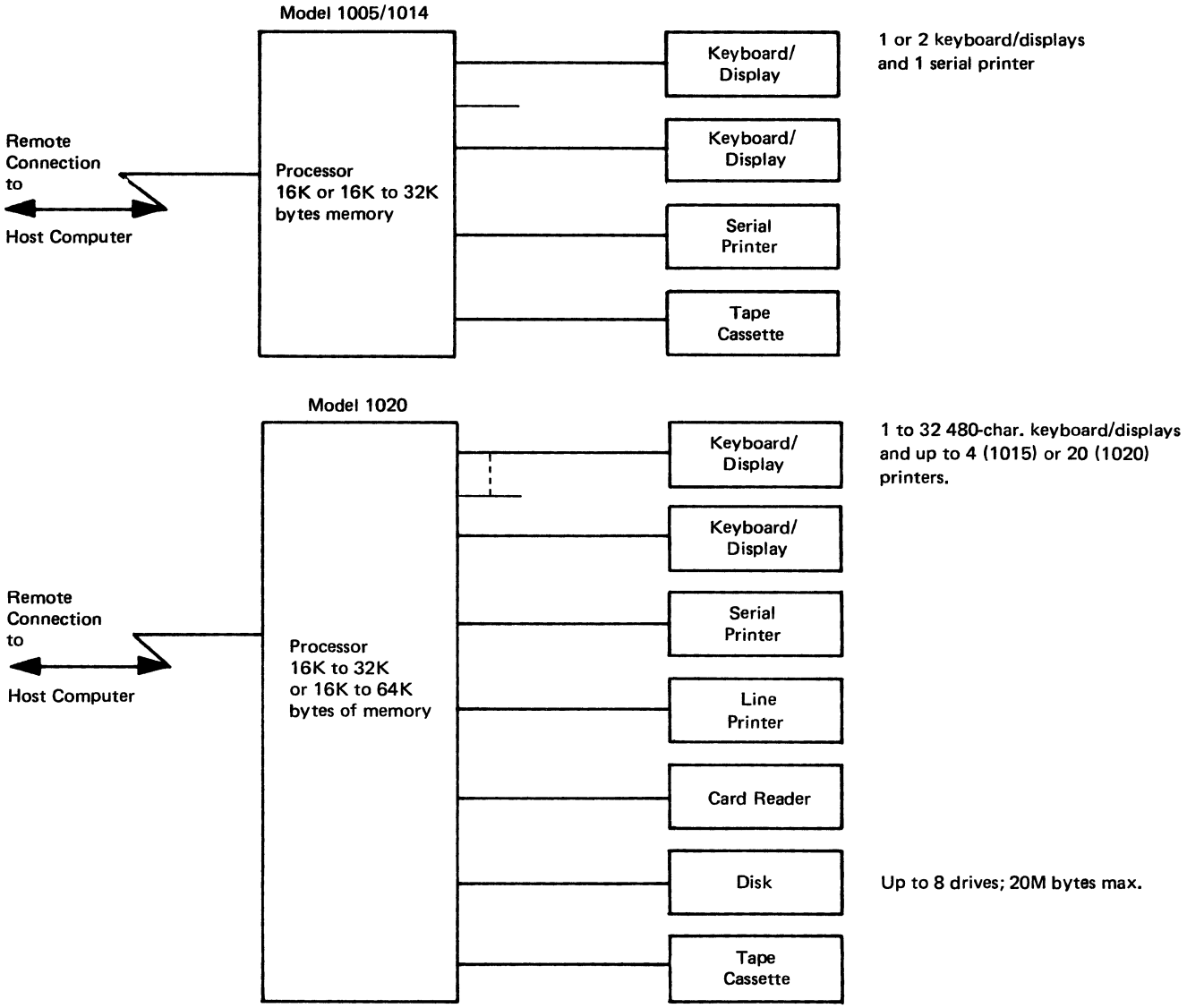
CASSETTE TAPE RECORDER: Included in each PTS 100 for program loading. Records data on a "Philips-type" cassette, which contains 300 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Record length is variable, with 60 bytes/record minimum. Total cassette capacity is rated at 120,000 bytes for 80-byte records or 307,000 bytes for 960-byte records. Read/write and rewind tape speeds are 10 and 40 inches/second, respectively. Maximum rewind time is about 90 seconds.

PRICING

The Raytheon PTS 100 is available for purchase or on a one- to five-year lease. Raytheon declined to supply complete pricing information, but furnished prices for the following representative systems and auxiliary devices. All processor configurations include a cassette drive for program loading and system interfacing. The quoted rental prices are for a one-year lease and include prime-shift maintenance. Purchase prices include installation. Maintenance prices are for a one-year contract covering eight hours per day, five days per week.

Raytheon PTS 100 Programmable Terminal System

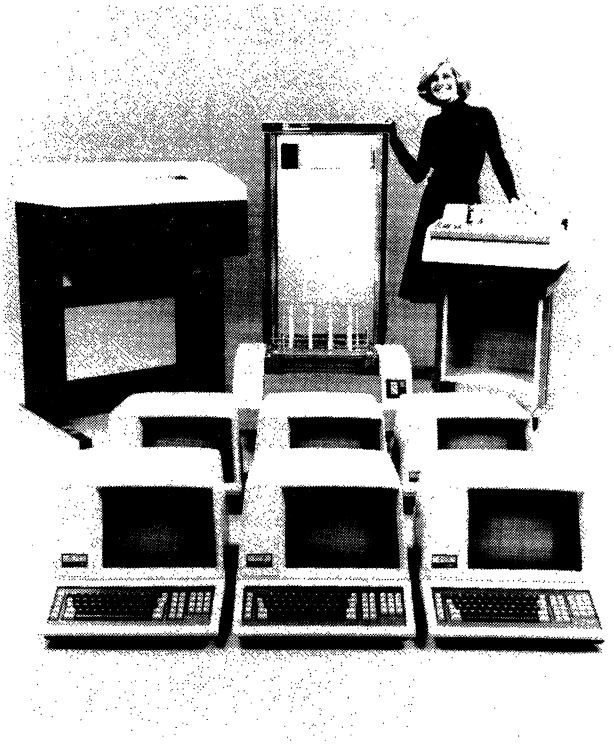
Configuration



		Monthly Rental*	Purchase	Monthly Maint.
1014	IBM 2260 Remote Emulation; 16K bytes, one 480- or 1920-char. display	$ 240	$ 8,650	$ 47
1005	IBM 3270 Remote Emulation; 16K bytes, one 480- or 1920-char. display	198	7,300	36
1014	IBM 2260 Remote Emulation; 16K bytes, two 480- or 1920-char. displays	350	10,900	56
1005	IBM 3270 Remote Emulation; 16K bytes, two 480- or 1920-char. displays	284	9,700	45
1015R	IBM 2260 or 3270 Remote Emulation; 24K bytes, eight 480-char. displays	758	24,940	135
1015R	IBM 2260 or 3270 Remote Emulation; 32K bytes; 32 480-char. displays	2,300	73,910	419
1015R	IBM 2260 or 3270 Remote Emulation; 32K bytes; eight 1920-char. displays	939	30,290	167
1020L	IBM 2260 or 3270 Local Emulation; 24K bytes, 16 480-char. displays	1,571	47,330	282
1020L	IBM 2260 or 3270 Local Emulation; 32K bytes, 32 480-char. displays	2,592	79,460	469
1020L	IBM 2260 or 3270 Local Emulation; 48K bytes, 16 1920-char. displays	1,945	59,230	347
Auxiliary Devices				
3401	Character Printer; 30 cps	160	4,000	35
3412	Printer; 165 cps	215	6,250	50
3301	Line Printer; 300 lpm	495	12,800	79
3711	Disk Storage; 2.5 million bytes	Contact vendor	Contact vendor	Contact vendor

*Includes prime-shift maintenance.■

Raytheon PTS 1200 Distributed Processing System



The PTS 1200, which utilizes Raytheon's PTS 100 hardware, supports off-line data entry and processing as well as remote batch and interactive communications.

The system emulates the IBM 3270, 2780, 3780 and HASP terminals. The PTS 1200 can also function as a host supporting a down-line network of PTS 100 terminals operating in 3270 mode.

A PTS 1200 Mark I with 64K bytes of memory, 8 CRT's, a 10MB disk drive, and a 120-cps printer is priced at $46,940, or $1,173 on a three-year lease including maintenance.

A PTS 1200 Mark II with 128K bytes of memory, 16 CRT's, two 63MB disk drives, and a 120-cps printer is priced at $130,230, or $3,042 on a three-year lease including maintenance.

MANAGEMENT SUMMARY

The PTS 1200 Distributed Processing System supports on-site processing for a variety of user-implemented, computer-based applications as well as concurrent batch or interactive communications with a host computer or another PTS 1200 system within a network. Operation is keyed to the concurrent servicing of multiple key-entry display stations via multitasking/multiprogramming support. Data can be simultaneously keyed or retrieved from as many as 24 keystations, edited, and stored on disk either for on-site processing or for later attended or unattended transmission to a host computer or PTS 1200.

As a terminal, the PTS 1200 can serve both as a remote batch processing system in a HASP multileaving environment and as a transaction-oriented interactive device communicating with a host processor. Through software emulation, the terminal can operate in batch mode as an IBM 2780, 3780, or 360 22/30, or in interactive mode as an IBM 3270. Concurrent remote batch, interactive, and off-line operations are supported. Both transmission modes operate under Bisynchronous (BSC) protocol; SDLC is not available at this writing.

Software support for the PTS 1200 includes six key elements: Autoquery, a data base inquiry and response facility; Macrol, a display-oriented language; a Disk Operating System; Data Entry; a utility library; and a set of programming and debugging aids.

CHARACTERISTICS

VENDOR: Raytheon Data Systems, 1415 Boston-Providence Turnpike, Norwood, Massachusetts 02062. Telephone (617) 762-6700.

DATE OF ANNOUNCEMENT: Information not available.

DATE OF FIRST DELIVERY: Information not available.

NUMBER DELIVERED TO DATE: Over 65,000 PTS 1200 and PTS 100 display units.

SERVICED BY: Raytheon Data Systems.

MODELS

The PTS 1200 Mark I and Mark II include a 16-bit PTS 100 processor with 64K bytes of MOS memory, which is expandable to 128K bytes in 64K-byte increments. The Mark I is supplied with a 10-megabyte disk drive mounted in the controller cabinet. The Mark II supports both 10-megabyte and 63-megabyte disk subsystems. The Mark I can accommodate up to 8 keyboard/display stations and up to 20 printers. Both systems support 45-, 120-, and 165-cps serial printers and 300- and 600-lpm line printers; a 300-cpm card reader; magnetic tape drives; and a cassette tape drive. The Mark I is available in six basic configurations, and the Mark II is available in two basic configurations.

COMMUNICATIONS

Half- or full-duplex synchronous communications are supported at 2000 to 9600 bits/second, using the EBCDIC code. Binary Synchronous (BSC) protocol is supported; SDLC protocol is currently not available. The PTS 1200 is transmission-compatible with the IBM 2780, 3780, and HASP terminals when operating in the batch mode, and with the IBM 3270 when in the interactive mode. The two

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Raytheon has designed the PTS 1200 from existing components of its prominent PTS 100 Programmable Terminal System, which boasts more than 65,000 installed display units. Raytheon's display-oriented PTS 100 minicomputer is the heart of the PTS 1200. The PTS 1200 system can range from a basic 64K bytes of MOS main memory and 10.4 million bytes of disk storage to 128K bytes of memory and 253 million bytes of disk storage, in increments of 64K bytes of memory and 10 and 63 million bytes of disk storage. Display screen capacities of 960 and/or 1920 characters are available.

USER REACTION

Datapro conducted telephone interviews with four users of the Raytheon PTS 1200 system during August 1980. Their names were selected from a list supplied by the vendor. These users had a total of 706 key-stations installed on 97 systems. The Raytheon systems had been installed for an average of four years. The following table summarizes the ratings assigned by the users.

	Excellent	Good	Fair	Poor	WA*
Overall performance	0	3	0	1	2.5
Ease of operation	1	3	0	0	3.3
Hardware reliability	0	2	1	1	2.3
Maintenance service	0	1	2	1	2.0
Software	0	3	1	0	2.8
Technical support	0	1	3	0	2.3

*Weighted Average on a scale of 4.0 for Excellent.

The users we contacted voiced a number of complaints about their PTS 1200 systems. Two users said that they would only recommend the system for the small distributed processing user because the system's memory is limited to 128K bytes. Three users did not feel that Raytheon was working to improve the system's growth capacity. One user thought that the IBM 8100 series offers more variability. Another user said that he was disappointed with the company's change from a Diablo character printer to a Nippon within the last year. Two users had experienced considerable downtime particularly with their disk drives. Two other users complained about ineffective service personnel and the unavailability of spare parts.

On the positive side, users cited the system's ease of operation, software programs, and flexible capabilities in keyboard design for special applications.□

communications modes are implemented via software emulation. Transmission is point-to-point over a switched or dedicated communications arrangement, or multipoint over a dedicated facility. An EIA Standard RS-232-C interface is provided for connection to an external modem.

A Teletype network support package, which combines the output of up to 20 teleprinters into one high-speed communications line, is available for the PTS 1200 Mark II. The package enables Teletype users to communicate with a Mark II system automatically, without requiring an operator to answer message requests. The Mark II gathers the Teletype messages, concentrates them, and transmits them to the central computer over the same high-speed communications line that is used for interactive communications between the Mark II and the host. Teletype messages may also be processed locally by the PTS 1200, offloading this processing from the mainframe.

DEVICE CONTROL

The PTS 1200 system is built around Raytheon's PTS-100 minicomputer. It is designed to serve in a stand-alone capacity as a shared-processor data entry system, gathering and editing data from as many as 24 local operator stations and storing the data on disk for later attended or unattended batch transmission to the host computer. Concurrently, transmission can be performed in an interactive mode, in which messages are transmitted immediately between the PTS 1200 and the host computer.

All operations are executed under the control of the Disk Operating System. Application programs are written by the user in Macrol, a high-level macro language, and can be tested on the PTS 1200 via a set of interactive programming and debugging aids. A source editor is available for keyboard entry and editing of programs, thereby eliminating the need for a keypunch. A data-base-related facility called Auto-query permits file development and access before the PTS 1200 is programmed. All systems and application programs are disk-resident. Systems programs are initially loaded to disk from cassette tape. Programs are called from disk by name and are immediately accessible to the operator.

The system supports three types of files: data, work, and temporary work files (or data sets). Data files typically consist of application master files, reference data, and tables and are organized according to a file index; they can be accessed sequentially, randomly, or by index key. Work files are defined as temporary file storage for the spooling and collection of input and preprocessed data as well as data to be merged with a master file; these files are organized sequentially and can be accessed sequentially (forward or backward). Temporary data sets are sequential files for program work space, scratch storage, etc., and are assigned to unallocated portions (free tracks) of disk storage. The system also supports a linked sequential structure of temporary data sets that maintains the forward/backward linkage. Users can insert, delete, or replace logical records, access records randomly, and request compression of data on the disk. The data sets can be established or purged by a single macro instruction.

The three types of file organization are defined as follows. Sequential files are in chronological sequence in the order of entry. Randomly accessed files retrieve data via a relative record number. Indexed files are accessed according to key values, which can be contained in one or more key files. A key file can contain up to 10 keys; each key can contain up to 32 numeric, alphanumeric, or alphabetic characters. One to 10 keys can be used to identify a record. The indexed file is currently limited to a single volume and cannot exceed 65K records.

Each disk cartridge (disk pack) is assigned a volume name. Before a file is accessed, the system performs a search for the specific volume, provided the volume parameter is specified.

System files include the File Directory, Program Library, and System Queue. The File Directory contains the names of system and user-named files, temporary data sets, and the unit number on which each data set resides. It also defines the starting and ending cylinder and track of each file. The Program Library contains the names of system and user programs, the size of each program, and, when specified, the sizes and names of all program modules. The System Queue contains the names of general files, such as files to be printed,

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transmitted, or received. Up to 20 queues are permitted. A general-purpose print utility (spooler/despooler) prints the contents of received files identified in a queue.

SOFTWARE

PTS 1200 system support includes the Disk Operating System, a macro language, a package of data-base-related programs, a utility library, diagnostic programming aids, and communications for the IBM 2780, 3780, and HASP remote batch terminals and the IBM 3270 information display terminals.

The Macrol language consists of 110 statements that direct the following functions: field edit and move, decimal and binary arithmetic, data conversion, comparison, branching, I/O, keyboard/display, compiler control, and data definition.

A library of 60 utility programs provides system housekeeping functions, such as compiling and listing a source program keyed or read from cards, maintaining the program library, allocating new files, initializing a disk, displaying the contents of the error log, etc. All utilities can be called directly from disk for concurrent execution with user-written applications programs.

The diagnostic programming and debugging aids allow the programmer to view and alter the contents of any disk sector; access and alter any absolute main storage address and display 320 bytes at a time in ASCII and hexadecimal; and perform maintenance on source programs from the keyboard. The Trace facility lets the programmer step through his program while watching it operate on one display, just as the operator sees it, and simultaneously observe register contents, program statement sequences, and branching on another display. Trace also has a breakpoint capability and can produce printed copy. A remote diagnostic feature is available that permits display and modification of memory and disk storage from a remote location via a dial-up terminal. The diagnostic feature is applicable to central-site PTS 1200 interrogation of remote PTS 1200 sites.

Autoquery is a basic data base inquiry and response facility that permits entry, retrieval, modification, and listing of data. All of its functions are immediately available to the user upon installation and before any programs are written. Record formats can be created on the screen, stored in a format file, and retrieved when requested. Records can be retrieved, modified or deleted; new records can be added to an existing file via keyboard or punched cards. A data base (indexed) file can be sorted according to a specified key sequence. Report formats can be created for listing, and data can be listed in forward or reverse sequence with the report title printed at the top of each page.

COMPONENTS

DISPLAY STATIONS: The CRT keyboard/display unit includes a 15-inch (diagonal measurement) screen and displays data in any one of the following formats:

Characters/display:	1920	960
Lines/display:	24	12
Characters/line:	80	80

A character set of 96 ASCII characters, including upper and lower case alphabetics, numerics, and special symbols, is displayed in green against a dark background. Each character is formed via a 7-by-9 dot matrix which is equivalent in clarity to a 9-by-13 dot matrix. Features include a non-glare screen, dual brightness levels, character blinking or blanking, insertion and deletion, full cursor positioning, and an addressable/readable cursor.

A 69- or 81-key typewriter-style keyboard and a data entry keyboard, with or without a program function keypad, are standard. The user software defines the keypad as either a numeric keypad or a program function keypad.

DISK STORAGE: Two configurations of disk storage subsystems are available, ranging from 10 megabytes to 253 megabytes maximum capacity. One configuration uses disk drives consisting of one fixed and one removable cartridge disk, each with a capacity of 5.0 megabytes, or 10 megabytes per drive. Four such drives can be connected to the system, thereby providing a total disk storage capacity of 40 megabytes. The 63-253 configuration employs a 63-megabyte removable disk pack drive. Up to four of these drives (253 megabytes of total disk storage) can be connected to the PTS-1200 system.

CASSETTE TAPE DRIVE: Records data on a "Philips-type" cassette, which contains 300 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Record length is variable, with 60 bytes/record minimum. Total cassette capacity is rated at 120,000 bytes for 80-byte records or 307,000 bytes for 960-byte records. Read/write and rewind tape speeds are 10 and 40 inches/second, respectively. Maximum rewind time is about 90 seconds.

CARD READER: Reads 80-column cards punched in Hollerith or binary code at a rated speed of 300 cards/minute. Input hopper and output stacker capacities are 600 cards each.

SERIAL PRINTERS: One impact matrix printer model and one daisy-wheel solid font printer model are available. The matrix printer is rated at 120 cps (132 columns) and is produced by Centronics as Model 702. The daisy-wheel solid font printer is rated at 55 cps and is produced by NEC.

LINE PRINTERS: Two drum printers with 132 print positions are available: a 300-lpm model and a 600-lpm model produced by Data Products as Models 2230 and 2260, respectively. Both printers feature a swing-open drum gate, are equipped with a 64-character print set, and accommodate standard, pin-fed 6-part forms from 4 to 16.75 inches wide. Line spacing is selectable at 6 or 8 lines per inch. A 12-channel vertical format unit is compatible with IBM carriage tapes.

MAGNETIC TAPE DRIVES: Two models are available. One is a tension-arm tape drive which records on 9-track, 800-bpi, NRZI, IBM-compatible, ½-inch magnetic tape. It accepts 10.5-inch tape reels and records at 37.5 inches per second. Rewind speed is 150 ips, and rewind time for a 2400-foot reel is 3.2 minutes. The drive has a dual-gap head and servo-controlled capstan.

Also offered is a vacuum column tape drive which records on 9-track, 800/1600-bpi, NRZI/phase-encoded, ANSI-compatible, ½-inch magnetic tape. The drive accepts 10.5-inch reels and records at 75 inches per second. Rewind speed is 200 ips, and rewind time for a 2400-foot reel is 2.4 minutes. The drive has a fully servo-controlled tape transport mechanism.

The PTS 1200 supports up to three tape drives.

PRICING

The Raytheon PTS 1200 is available for purchase or on a one-, two-, or three-year lease which includes prime-shift maintenance. Raytheon declined to supply complete pricing information, but furnished prices for the following representative systems and auxiliary devices. The configurations listed below include communications support and a cassette drive for initial loading of systems software. Cable prices are not included.

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	Monthly Rental*			
	1-Year Lease	3-Year Lease	Purchase	Monthly Maint.
Mark I with: Eight 1920-character displays, 64K-byte memory, 10-megabyte disk drive, and 120-cps serial printer	$1,412	$1,173	$46,940	$341
Mark II with: Sixteen 1920-character displays, 128K-byte memory, two 63-megabyte disk drives, and 120-cps serial printer	3,641	3,042	130,230	912
Options				
Display station with keyboard				
Serial printer: 55-cps letter quality, solid front	220	180	5,725	65
Line printer (300 lpm)	N/A	371	12,800	91

*Includes prime-shift maintenance.■